

LIGHT UNFLAVORED MESONS ($S = C = B = 0$)

For $I = 1$ (π, b, ρ, a): $u\bar{d}, (u\bar{u} - d\bar{d})/\sqrt{2}, d\bar{u}$;
for $I = 0$ ($\eta, \eta', h, h', \omega, \phi, f, f'$): $c_1(u\bar{u} + d\bar{d}) + c_2(s\bar{s})$

$f_0(500)$ or σ
was $f_0(600)$

$I^G(J^{PC}) = 0^+(0^{++})$

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$f_0(500)$ T-MATRIX POLE \sqrt{s}

Note that $\Gamma \approx 2 \text{ Im}(\sqrt{s}_{\text{pole}})$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(400–550)–i(200–350) OUR ESTIMATE			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
(440 ± 10)–i(238 ± 10)	1 ALBALADEJO 12	RVUE	Compilation
(445 ± 25)–i(278 ⁺²² ₋₁₈)	2,3 GARCIA-MAR..11	RVUE	Compilation
(457 ⁺¹⁴ ₋₁₃)–i(279 ⁺¹¹ ₋₇)	2,4 GARCIA-MAR..11	RVUE	Compilation
(442 ⁺⁵ ₋₈)–i(274 ⁺⁶ ₋₅)	5 MOUSSALLAM11	RVUE	Compilation
(452 ± 13)–i(259 ± 16)	6 MENNESSIER 10	RVUE	Compilation
(448 ± 43)–i(266 ± 43)	7 MENNESSIER 10	RVUE	Compilation
(455 ± 6 ⁺³¹ ₋₁₃)–i(278 ± 6 ⁺³⁴ ₋₄₃)	8 CAPRINI 08	RVUE	Compilation
(463 ± 6 ⁺³¹ ₋₁₇)–i(259 ± 6 ⁺³³ ₋₃₄)	9 CAPRINI 08	RVUE	Compilation
(552 ⁺⁸⁴ ₋₁₀₆)–i(232 ⁺⁸¹ ₋₇₂)	10 ABLIKIM 07A	BES2	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$
(466 ± 18)–i(223 ± 28)	11 BONVICINI 07	CLEO	$D^+ \rightarrow \pi^- \pi^+ \pi^+$
(472 ± 30)–i(271 ± 30)	12 BUGG 07A	RVUE	Compilation
(484 ± 17)–i(255 ± 10)	13 GARCIA-MAR..07	RVUE	Compilation
(430)–i(325)	13 ANISOVICH 06	RVUE	Compilation
(441 ⁺¹⁶ ₋₈)–i(272 ⁺⁹ _{-12.5})	14 CAPRINI 06	RVUE	$\pi\pi \rightarrow \pi\pi$
(470 ± 50)–i(285 ± 25)	15 ZHOU 05	RVUE	
(541 ± 39)–i(252 ± 42)	16 ABLIKIM 04A	BES2	$J/\psi \rightarrow \omega \pi^+ \pi^-$
(528 ± 32)–i(207 ± 23)	17 GALLEGOS 04	RVUE	Compilation
(440 ± 8)–i(212 ± 15)	18 PELAEZ 04A	RVUE	$\pi\pi \rightarrow \pi\pi$
(533 ± 25)–i(249 ± 25)	19 BUGG 03	RVUE	
517 – i240	BLACK 01	RVUE	$\pi^0 \pi^0 \rightarrow \pi^0 \pi^0$
(470 ± 30)–i(295 ± 20)	14 COLANGELO 01	RVUE	$\pi\pi \rightarrow \pi\pi$
(535 ⁺⁴⁸ ₋₃₆)–i(155 ⁺⁷⁶ ₋₅₃)	20 ISHIDA 01		$\Upsilon(3S) \rightarrow \Upsilon \pi\pi$
610 ± 14 – i620 ± 26	21 SUROVTSEV 01	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
(540 ⁺³⁶ ₋₂₉)–i(193 ⁺³² ₋₄₀)	ISHIDA 00B		$p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0$
445 – i235	HANNAH 99	RVUE	π scalar form factor
(523 ± 12)–i(259 ± 7)	KAMINSKI 99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
442 – i 227	OLLER 99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
469 – i203	OLLER 99B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
445 – i221	OLLER 99C	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$
(1530 ⁺⁹⁰ ₋₂₅₀)–i(560 ± 40)	ANISOVICH 98B	RVUE	Compilation
420 – i 212	LOCHER 98	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
440 – i245	22 DOBADO 97	RVUE	Compilation
(602 ± 26)–i(196 ± 27)	23 ISHIDA 97		$\pi\pi \rightarrow \pi\pi$
(537 ± 20)–i(250 ± 17)	24 KAMINSKI 97B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, 4\pi$
470 – i250	25,26 TORNQVIST 96	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
387 – i305	26,27 JANSEN 95	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
420 – i370	28 ACHASOV 94	RVUE	$\pi\pi \rightarrow \pi\pi$
(506 ± 10)–i(247 ± 3)	KAMINSKI 94	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
370 – i356	29 ZOU 94B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
408 – i342	26,29 ZOU 93	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$

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470 – i208	³⁰ VANBEVEREN 86	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta,$...	NODE=M014PP;LINKAGE=AD
(750 ± 50) – i(450 ± 50)	³¹ ESTABROOKS 79	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	NODE=M014PP;LINKAGE=GM
(660 ± 100) – i(320 ± 70)	PROTOPOP... 73	HBC	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
650 – i370	³² BASDEVANT 72	RVUE	$\pi\pi \rightarrow \pi\pi$	
1 Applying the chiral unitary approach at NLO to the K_{e4} data of BATLEY 10 and $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.				
2 Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.				
3 Analytic continuation using Roy equations.				
4 Analytic continuation using GKPY equations.				
5 Using Roy equations.				
6 Average of three variants of the analytic K-matrix model. Uses the K_{e4} data of BATLEY 08A and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73 and GRAYER 74.				
7 Average of the analyses of three data sets in the K-matrix model. Uses the data of BATLEY 08A, HYAMS 73, and GRAYER 74, partially of COHEN 80 or ETKIN 82B.				
8 From the K_{e4} data of BATLEY 08A and $\pi N \rightarrow \pi\pi N$ data of HYAMS 73.				
9 From the K_{e4} data of BATLEY 08A and $\pi N \rightarrow \pi\pi N$ data of PROTOPOPESCU 73, GRAYER 74, and ESTABROOKS 74.				
10 From a mean of three different $f_0(500)$ parametrizations. Uses 40k events.				
11 From an isobar model using 2.6k events.				
12 Reanalysis of ABLIKIM 04A, PISLAK 01, and HYAMS 73 data.				
13 Using the N/D method.				
14 From the solution of the Roy equation (ROY 71) for the isoscalar S-wave and using a phase-shift analysis of HYAMS 73 and PROTOPOPESCU 73 data.				
15 Reanalysis of the data from PROTOPOPESCU 73, ESTABROOKS 74, GRAYER 74, ROSSÉLET 77, PISLAK 03, and AKHMETSHIN 04.				
16 From a mean of six different analyses and $f_0(500)$ parameterizations.				
17 Using data on $\psi(2S) \rightarrow J/\psi\pi\pi$ from BAI 00E and on $\Upsilon(nS) \rightarrow \Upsilon(mS)\pi\pi$ from BUTLER 94B and ALEXANDER 98.				
18 Reanalysis of data from PROTOPOPESCU 73, ESTABROOKS 74, GRAYER 74, and COHEN 80 in the unitarized ChPT model.				
19 From a combined analysis of HYAMS 73, AUGUSTIN 89, AITALA 01B, and PISLAK 01.				
20 A similar analysis (KOMADA 01) finds $(580^{+79}_{-30}) - i(190^{+107}_{-49})$ MeV.				
21 Coupled channel reanalysis of BATON 70, BENSINGER 71, BAILLON 72, HYAMS 73, HYAMS 75, ROSSELET 77, COHEN 80, and ETKIN 82B using the uniformizing variable.				
22 Using the inverse amplitude method and data of ESTABROOKS 73, GRAYER 74, and PROTOPOPESCU 73.				
23 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.				
24 Average and spread of 4 variants ("up" and "down") of KAMINSKI 97B 3-channel model.				
25 Uses data from BEIER 72B, OCHS 73, HYAMS 73, GRAYER 74, ROSSELET 77, CASON 83, ASTON 88, and ARMSTRONG 91B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.				
26 Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.				
27 Analysis of data from FALVARD 88.				
28 Analysis of data from OCHS 73, ESTABROOKS 75, ROSSELET 77, and MUKHIN 80.				
29 Analysis of data from OCHS 73, GRAYER 74, and ROSSELET 77.				
30 Coupled-channel analysis using data from PROTOPOPESCU 73, HYAMS 73, HYAMS 75, GRAYER 74, ESTABROOKS 74, ESTABROOKS 75, FROGGATT 77, CORDEN 79, BISWAS 81.				
31 Analysis of data from APEL 73, GRAYER 74, CASON 76, PAWLICKI 77. Includes spread and errors of 4 solutions.				
32 Analysis of data from BATON 70, BENSINGER 71, COLTON 71, BAILLON 72, PROTOPOPESCU 73, and WALKER 67.				

$f_0(500)$ BREIT-WIGNER MASS OR K-MATRIX POLE PARAMETERS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
(400–550) OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
513 ± 32	³³ MURAMATSU 02	CLEO	$e^+ e^- \approx 10$ GeV	
478 ⁺²⁴ ₋₂₃ ± 17	AITALA 01B	E791	$D^+ \rightarrow \pi^-\pi^+\pi^+$	
563 ⁺⁵⁸ ₋₂₉	³⁴ ISHIDA 01		$\Upsilon(3S) \rightarrow \Upsilon\pi\pi$	
555	³⁵ ASNER 00	CLE2	$\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$	
540 ± 36	ISHIDA 00B		$p\bar{p} \rightarrow \pi^0\pi^0\pi^0$	
750 ± 4	ALEKSEEV 99	SPEC	$1.78\pi^- p_{\text{polar}} \rightarrow \pi^-\pi^+n$	
744 ± 5	ALEKSEEV 98	SPEC	$1.78\pi^- p_{\text{polar}} \rightarrow \pi^-\pi^+n$	
759 ± 5	³⁶ TROYAN 98		$5.2 np \rightarrow np\pi^+\pi^-$	

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780±30	ALDE	97	GAM2	$450 \text{ } pp \rightarrow pp\pi^0\pi^0$
585±20	37 ISHIDA	97		$\pi\pi \rightarrow \pi\pi$
761±12	38 SVEC	96	RVUE	$6\text{--}17 \pi N_{\text{polar}} \rightarrow \pi^+\pi^-N$
~ 860	39,40 TORNQVIST	96	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
1165±50	41,42 ANISOVICH	95	RVUE	$\pi^-p \rightarrow \pi^0\pi^0n, \bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\pi^0\eta, \pi^0\eta\eta$
~ 1000	43 ACHASOV	94	RVUE	$\pi\pi \rightarrow \pi\pi$
414±20	38 AUGUSTIN	89	DM2	
33 Statistical uncertainty only.				
34 A similar analysis (KOMADA 01) finds 526^{+48}_{-37} MeV.				
35 From the best fit of the Dalitz plot.				
36 6σ effect, no PWA.				
37 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.				
38 Breit-Wigner fit to S-wave intensity measured in $\pi N \rightarrow \pi^-\pi^+N$ on polarized targets. The fit does not include $f_0(980)$.				
39 Uses data from ASTON 88, OCHS 73, HYAMS 73, ARMSTRONG 91B, GRAYER 74, CASON 83, ROSSELET 77, and BEIER 72B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.				
40 Also observed by ASNER 00 in $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$ decays.				
41 Uses $\pi^0\pi^0$ data from ANISOVICH 94, AMSLER 94D, and ALDE 95B, $\pi^+\pi^-$ data from OCHS 73, GRAYER 74 and ROSSELET 77, and $\eta\eta$ data from ANISOVICH 94.				
42 The pole is on Sheet III. Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.				
43 Analysis of data from OCHS 73, ESTABROOKS 75, ROSSELET 77, and MUKHIN 80.				

$f_0(500)$ BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
(400–700) OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
335± 67	44 MURAMATSU 02	CLEO	$e^+e^- \approx 10 \text{ GeV}$	
$324^{+42}_{-40}\pm 21$	AITALA	01B	$E791 \quad D^+ \rightarrow \pi^-\pi^+\pi^+$	
372^{+229}_{-95}	45 ISHIDA	01	$\gamma(3S) \rightarrow \gamma\pi\pi$	
540	46 ASNER	00	CLE2 $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$	
372± 80	ISHIDA	00B	$p\bar{p} \rightarrow \pi^0\pi^0\pi^0$	
119± 13	ALEKSEEV	99	SPEC $1.78 \pi^- p_{\text{polar}} \rightarrow \pi^-\pi^+n$	
77± 22	ALEKSEEV	98	SPEC $1.78 \pi^- p_{\text{polar}} \rightarrow \pi^-\pi^+n$	
35± 12	47 TROYAN	98	$5.2 np \rightarrow np\pi^+\pi^-$	
780± 60	ALDE	97	GAM2 $450 \text{ } pp \rightarrow pp\pi^0\pi^0$	
385± 70	48 ISHIDA	97	$\pi\pi \rightarrow \pi\pi$	
290± 54	49 SVEC	96	RVUE $6\text{--}17 \pi N_{\text{polar}} \rightarrow \pi^+\pi^-N$	
~ 880	50,51 TORNQVIST	96	RVUE $\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$	
460± 40	52,53 ANISOVICH	95	RVUE $\pi^-p \rightarrow \pi^0\pi^0n, \bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\pi^0\eta, \pi^0\eta\eta$	
~ 3200	54 ACHASOV	94	RVUE $\pi\pi \rightarrow \pi\pi$	
494± 58	49 AUGUSTIN	89	DM2	
44 Statistical uncertainty only.				
45 A similar analysis (KOMADA 01) finds 301^{+145}_{-100} MeV.				
46 From the best fit of the Dalitz plot.				
47 6σ effect, no PWA.				
48 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.				
49 Breit-Wigner fit to S-wave intensity measured in $\pi N \rightarrow \pi^-\pi^+N$ on polarized targets. The fit does not include $f_0(980)$.				
50 Uses data from ASTON 88, OCHS 73, HYAMS 73, ARMSTRONG 91B, GRAYER 74, CASON 83, ROSSELET 77, and BEIER 72B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.				
51 Also observed by ASNER 00 in $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$ decays.				
52 Uses $\pi^0\pi^0$ data from ANISOVICH 94, AMSLER 94D, and ALDE 95B, $\pi^+\pi^-$ data from OCHS 73, GRAYER 74 and ROSSELET 77, and $\eta\eta$ data from ANISOVICH 94.				
53 The pole is on Sheet III. Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.				
54 Analysis of data from OCHS 73, ESTABROOKS 75, ROSSELET 77, and MUKHIN 80.				

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$f_0(500)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	dominant
$\Gamma_2 \gamma\gamma$	seen

$f_0(500)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$		DOCUMENT ID	TECN	COMMENT	Γ_2
<u>VALUE (keV)</u>					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.7 ± 0.4	55	HOFERICHTER11	RVUE	Compilation	
3.08 ± 0.82	56	MENNESSIER 11	RVUE	Compilation	
2.08 ± 0.2 $^{+0.07}_{-0.04}$	57	MOUSSALLAM11	RVUE	Compilation	
2.08	58	MAO	09	RVUE	
1.2 ± 0.4	59	BERNABEU	08	RVUE	
3.9 ± 0.6	56	MENNESSIER	08	RVUE $\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	
1.8 ± 0.4	60	OLLER	08	RVUE	
1.68 ± 0.15	60,61	OLLER	08A	RVUE	
3.1 ± 0.5	62,63	PENNINGTON	08	RVUE	
2.4 ± 0.4	63,64	PENNINGTON	08	RVUE	
4.1 ± 0.3	65	PENNINGTON	06	RVUE $\gamma\gamma \rightarrow \pi^0 \pi^0$	
3.8 ± 1.5	66,67	BOGLIONE	99	RVUE $\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	
5.4 ± 2.3	66	MORGAN	90	RVUE $\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	
10 ± 6	67	COURAU	86	DM1 $e^+ e^- \rightarrow \pi^+ \pi^- e^+ e^-$	
55 Using Roy-Steiner equations with $\pi\pi$ phase shifts from an update of COLANGELO 01 and from GARCIA-MARTIN 11A.					
56 Using an analytic K-matrix model.					
57 Using dispersion integral with phase input from Roy equations and data from MARSISKE 90, BOYER 90, BEHREND 92, UEHARA 08A, and MORI 07.					
58 Used dispersion theory. The value quoted used the $f_0(500)$ pole position of 457 – i276 MeV.					
59 Using p , n polarizabilities from PDG 06 and fitting to $\pi\pi$ phase motion from GARCIA-MARTIN 07 and σ -poles from GARCIA-MARTIN 07 and CAPRINI 06.					
60 Using twice-subtracted dispersion integrals.					
61 Supersedes OLLER 08.					
62 Solution A (preferred solution based on χ^2 -analysis).					
63 Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.					
64 Solution B (worse than solution A; still acceptable when systematic uncertainties are included).					
65 Using unitarity and the σ pole position from CAPRINI 06.					
66 This width could equally well be assigned to the $f_0(1370)$. The authors analyse data from BOYER 90 and MARSISKE 90 and report strong correlation with $\gamma\gamma$ width of $f_2(1270)$.					
67 Supersedes MORGAN 90.					

$f_0(500)$ REFERENCES

ALBALADEJO 12	PR D86 034003	M. Albala dejo, J.A. Oller R. Garcia-Martin <i>et al.</i>	(MURC)
GARCIA-MAR... 11	PRL 107 072001	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
GARCIA-MAR... 11A	PR D83 074004	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
HOFERICHTER 11	EPJ C71 1743	M. Hoferichter, D.R. Phillips, C. Schat	(BONN+)
MENNESSIER 11	PL B696 40	G. Mennessier, S. Narison, X.-G. Wang	
MOUSSALLAM 11	EPJ C71 1814	B. Moussallam	
BATLEY 10	PL B686 101	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
BATLEY 10C	EPJ C70 635	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
MENNESSIER 10	PL B688 59	G. Mennessier, S. Narison, X.-G. Wang	
MAO 09	PR D77 116008	Y. Mao <i>et al.</i>	
BATLEY 08A	EPJ C54 411	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
BERNABEU 08	PRL 100 241804	J. Bernabeu, J. Prades	(IFIC, GRAN)
CAPRINI 08	PR D77 114019	I. Caprini	
MENNESSIER 08	PL B665 205	G. Mennessier, S. Narison, W. Ochs	
OLLER 08	PL B659 201	J.A. Oller, L. Roca, C. Schat	(MURC, UBA)
OLLER 08A	EPJ A37 15	J.A. Oller, L. Roca	(MURC)
PENNINGTON 08	EPJ C56 1	M.R. Pennington <i>et al.</i>	
UEHARA 08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)
ABLIKIM 07A	PL B645 19	M. Ablikim <i>et al.</i>	(BES Collab.)
BONVICINI 07	PR D76 012001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
BUGG 07A	JPG 34 151	D.V. Bugg <i>et al.</i>	
GARCIA-MAR... 07	PR D76 074034	R. Garcia-Martin, J.R. Pelaez, F.J. Yndurain	
MORI 07	PR D75 051101	T. Mori <i>et al.</i>	(BELLE Collab.)
ANISOVICH 06	IJMP A21 3615	V.V. Anisovich	
CAPRINI 06	PRL 96 132001	I. Caprini, G. Colangelo, H. Leutwyler	(BCIP+)
PDG 06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
PENNINGTON 06	PR D97 011601	M.R. Pennington	
ZHOU 05	JHEP 0502 043	Z.Y. Zhou <i>et al.</i>	

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REFID=51652

REFID=51137

REFID=51076

REFID=51004

REFID=51184

REFID=50823

ABLIKIM	04A	PL B598 149	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=49740
AKHMETSHIN	04	PL B578 285	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=49609
GALLEGOS	04	PR D69 074033	A. Gallegos <i>et al.</i>		REFID=49769
PELAEZ	04A	MPL A19 2879	J.R. Pelaez		REFID=50347
BUGG	03	PL B572 1	D.V. Bugg		REFID=49586
PISLAK	03	PR D67 072004	S. Pislak <i>et al.</i>	(BNL E865 Collab.)	REFID=49344
Also		PR D81 119903E	S. Pislak <i>et al.</i>	(BNL E865 Collab.)	REFID=53337
MURAMATSU	02	PRL 89 251802	H. Muramatsu <i>et al.</i>	(CLEO Collab.)	REFID=49081
Also		PRL 90 059901 (errat)	H. Muramatsu <i>et al.</i>	(CLEO Collab.)	REFID=49385
AITALA	01B	PRL 86 770	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)	REFID=48005
BLACK	01	PR D64 014031	D. Black <i>et al.</i>		REFID=48314
COLANGELO	01	NP B603 125	G. Colangelo, J. Gasser, H. Leytwyler		REFID=49180
ISHIDA	01	PL B518 47	M. Ishida <i>et al.</i>		REFID=48354
KOMADA	01	PL B508 31	T. Komada <i>et al.</i>		REFID=48541
PISLAK	01	PRL 87 221801	S. Pislak <i>et al.</i>	(BNL E865 Collab.)	REFID=48433
Also		PR D67 072004	S. Pislak <i>et al.</i>	(BNL E865 Collab.)	REFID=49344
Also		PRL 105 019901E	S. Pislak <i>et al.</i>	(BNL E865 Collab.)	REFID=53338
SUROVTSEV	01	PR D63 054024	Y.S. Surovtsev, D. Krupa, M. Nagy		REFID=48310
ASNER	00	PR D61 012002	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=47339
BAI	00E	PR D62 032002	J. Bai <i>et al.</i>	(BES Collab.)	REFID=47955
ISHIDA	00B	PTP 104 203	M. Ishida <i>et al.</i>		REFID=48358
ALEKSEEV	99	NP B541 3	I.G. Alekseev <i>et al.</i>		REFID=46614
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington		REFID=46931
HANNAH	99	PR D60 017502	T. Hannah		REFID=46935
KAMINSKI	99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN)	REFID=46927
OLLER	99	PR D60 099906 (erratum)	J.A. Oller <i>et al.</i>		REFID=46899
OLLER	99B	NP A652 407 (erratum)	J.A. Oller, E. Oset		REFID=46924
OLLER	99C	PR D60 074023	J.A. Oller, E. Oset		REFID=47386
ALEKSEEV	98	PAN 61 174	I.G. Alekseev <i>et al.</i>		REFID=46328
ALEXANDER	98	PR D58 052004	J.P. Alexander <i>et al.</i>		REFID=46329
ANISOVICH	98B	SPU 41 419	V.V. Anisovich <i>et al.</i>	(CLEO Collab.)	REFID=46331
		Translated from UFN 168 481.			
LOCHER	98	EPJ C4 317	M.P. Locher <i>et al.</i>	(PSI)	REFID=46372
TROYAN	98	JINRRC 5-91 33	Yu. Troyan <i>et al.</i>		REFID=46615
ALDE	97	PL B397 350	D.M. Alde <i>et al.</i>	(GAMS Collab.)	REFID=45392
DOBADO	97	PR D56 3057	A. Dobado, J.R. Pelaez		REFID=53964
ISHIDA	97	PTP 98 1005	S. Ishida <i>et al.</i>	(TOKY, MIYA, KEK)	REFID=45998
KAMINSKI	97B	PL B413 130	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, IPN)	REFID=45778
Also		PTP 95 745	S. Ishida <i>et al.</i>	(TOKY, MIYA, KEK)	REFID=45770
SVEC	96	PR D53 2343	M. Svec	(MCGI)	REFID=44509
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)	REFID=44507
ALDE	95B	ZPHY C66 375	D.M. Alde <i>et al.</i>	(GAMS Collab.)	REFID=44375
ANISOVICH	95	PL B355 363	V.V. Anisovich <i>et al.</i>	(PNPI, SERP)	REFID=44442
JANSSEN	95	PR D52 2690	G. Janssen <i>et al.</i>	(STON, ADLD, JULI)	REFID=44508
ACHASOV	94	PR D49 5779	N.N. Achasov, G.N. Shestakov	(NOVM)	REFID=44087
AMSLER	94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44093
ANISOVICH	94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43659
BUTLER	94B	PR D49 40	F. Butler <i>et al.</i>	(CLEO Collab.)	REFID=43799
KAMINSKI	94	PR D50 3145	R. Kaminski, L. Lesniak, J.P. Maillet	(CRAC+)	REFID=45771
ZOU	94B	PR D50 591	B.S. Zou, D.V. Bugg	(LOQM)	REFID=44072
ZOU	93	PR D48 R3948	B.S. Zou, D.V. Bugg	(LOQM)	REFID=43672
BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.)	REFID=43172
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41862
BOYER	90	PR D42 1350	J. Boyer <i>et al.</i>	(Mark II Collab.)	REFID=41362
MARSISKE	90	PR D41 3324	H. Marsiske <i>et al.</i>	(Crystal Ball Collab.)	REFID=41351
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)	REFID=41583
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41004
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=40262
FALVARD	88	PR D38 2706	A. Falvard <i>et al.</i>	(CLER, FRAS, LALO+)	REFID=40576
COURAU	86	NP B271 1	A. Courau <i>et al.</i>	(CLER, LALO)	REFID=44510
VANBEVEREN	86	ZPHY C30 615	E. van Beveren <i>et al.</i>	(NIJM, BIEL)	REFID=45769
CASON	83	PR D28 1586	N.M. Cason <i>et al.</i>	(NDAM, ANL)	REFID=20752
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)	REFID=20390
BISWAS	81	PRL 47 1378	N.N. Biswas <i>et al.</i>	(NDAM, ANL)	REFID=21106
COHEN	80	PR D22 2595	D. Cohen <i>et al.</i>	(ANL) IJP	REFID=20381
MUKHIN	80	JETPL 32 601	K.N. Mukhin <i>et al.</i>	(KIAE)	REFID=44528
		Translated from ZETFP 32 616.			
CORDEN	79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+) JP	REFID=20374
ESTABROOKS	79	PR D19 2678	P. Estabrooks	(CARL)	REFID=20375
FROGGATT	77	NP B129 89	C.D. Froggatt, J.L. Petersen	(GLAS, NORD)	REFID=21072
PAWLICKI	77	PR D15 3196	A.J. Pawlicki <i>et al.</i>	(ANL) IJ	REFID=20367
ROSSELET	77	PR D15 574	L. Rosselet <i>et al.</i>	(GEVA, SACL)	REFID=11004
CASON	76	PRL 36 1485	N.M. Cason <i>et al.</i>	(NDAM, ANL) IJ	REFID=21064
ESTABROOKS	75	NP B95 322	P.G. Estabrooks, A.D. Martin	(DURH)	REFID=20642
HYAMS	75	NP B100 205	B.D. Hyams <i>et al.</i>	(CERN, MPIM)	REFID=20355
SRINIVASAN	75	PR D12 681	V. Srinivasan <i>et al.</i>	(NDAM, ANL)	REFID=21062
ESTABROOKS	74	NP B79 301	P.G. Estabrooks, A.D. Martin	(DURH)	REFID=20111
GRAYER	74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM)	REFID=20113
APEL	73	PL 41B 542	W.D. Apel <i>et al.</i>	(KARL, PISA)	REFID=44532
ESTABROOKS	73	Tallahassee	P.G. Estabrooks <i>et al.</i>	(CERN, MPIM)	REFID=20345
HYAMS	73	NP B64 134	B.D. Hyams <i>et al.</i>	(CERN, MPIM)	REFID=20107
OCHS	73	Thesis	W. Ochs	(MPIM, MUNI)	REFID=20349
PROTOPOP...	73	PR D7 1279	S.D. Protopopescu <i>et al.</i>	(LBL)	REFID=20108
BAILLON	72	PL 38B 555	P.H. Baillon <i>et al.</i>	(SLAC)	REFID=20093
BASDEVANT	72	PL 41B 178	J.L. Basdevant, C.D. Froggatt, J.L. Petersen	(CERN)	REFID=20095
BEIER	72B	PR 29 511	E.W. Beier <i>et al.</i>	(PENN)	REFID=44530
BENSINGER	71	PL 36B 134	J.R. Bensinger <i>et al.</i>	(WISC)	REFID=21006
COLTON	71	PR D3 2028	E.P. Colton <i>et al.</i>	(LBL, FNAL, UCLA+)	REFID=44533
ROY	71	PL 36B 353	S.M. Roy		REFID=51107
BATON	70	PL 33B 528	J.P. Baton, G. Laurens, J. Reignier	(SACL)	REFID=20086
WALKER	67	RMP 39 695	W.D. Walker	(WISC)	REFID=20960

$\rho(770)$ $I^G(J^{PC}) = 1^+(1^{--})$

A REVIEW GOES HERE – Check our WWW List of Reviews

NODE=M009

 $\rho(770)$ MASS

We no longer list S-wave Breit-Wigner fits, or data with high combinatorial background.

NEUTRAL ONLY, $e^+ e^-$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
775.26±0.25 OUR AVERAGE					
[775.49 ± 0.34 MeV OUR 2012 AVERAGE]					
775.02±0.35	1 LEES	12G	BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$	
775.97±0.46±0.70	900k	2 AKHMETSHIN 07		$e^+ e^- \rightarrow \pi^+ \pi^-$	
774.6 ± 0.4 ± 0.5	800k	3,4 ACHASOV 06	SND	$e^+ e^- \rightarrow \pi^+ \pi^-$	
775.65±0.64±0.50	114k	5,6 AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^-$	
775.9 ± 0.5 ± 0.5	1.98M	7 ALOISIO 03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
775.8 ± 0.9 ± 2.0	500k	7 ACHASOV 02	SND	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
775.9 ± 1.1		8 BARKOV 85	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
775.8 ± 0.5 ± 0.3	1.98M	9 ALOISIO 03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=2
775.9 ± 0.6 ± 0.5	1.98M	10 ALOISIO 03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=3
775.0 ± 0.6 ± 1.1	500k	11 ACHASOV 02	SND	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=3
775.1 ± 0.7 ± 5.3		12 BENAYOUN 98	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-, \mu^+ \mu^-$	
770.5 ± 1.9 ± 5.1		13 GARDNER 98	RVUE	$0.28-0.92 e^+ e^- \rightarrow \pi^+ \pi^-$	
764.1 ± 0.7		14 O'CONNELL 97	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	
757.5 ± 1.5		15 BERNICHA 94	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	
768 ± 1		16 GESENKEN...	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	

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NODE=M009M0
NEW

CHARGED ONLY, τ DECAYS and $e^+ e^-$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
775.11±0.34 OUR AVERAGE						
[775.11 ± 0.34 MeV OUR 2012 AVERAGE]						
774.6 ± 0.2 ± 0.5	5.4M	17,18 FUJIKAWA 08	BELL	±	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
775.5 ± 0.7		18,19 SCHABEL 05C	ALEP		$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
775.5 ± 0.5 ± 0.4	1.98M	7 ALOISIO 03	KLOE		$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
775.1 ± 1.1 ± 0.5	87k	20,21 ANDERSON 00A	CLE2		$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
774.8 ± 0.6 ± 0.4	1.98M	10 ALOISIO 03	KLOE	–	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=2
776.3 ± 0.6 ± 0.7	1.98M	10 ALOISIO 03	KLOE	+	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=3
773.9 ± 2.0 ± 0.3		22 SANZ-CILLERO03	RVUE		$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
774.5 ± 0.7 ± 1.5	500k	7 ACHASOV 02	SND	±	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=2
775.1 ± 0.5		23 PICH 01	RVUE		$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	

NODE=M009M5
NODE=M009M5

MIXED CHARGES, OTHER REACTIONS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
763.0±0.3±1.2						
763.0±0.3±1.2	600k	24 ABELE	99E	CBAR	0±	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$

NODE=M009M7
NODE=M009M7

NODE=M009M3

CHARGED ONLY, HADROPRODUCED

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
766.5±1.1 OUR AVERAGE						
763.7±3.2		ABELE 97	CBAR		$\bar{p}n \rightarrow \pi^- \pi^0 \pi^0$	
768 ± 9		AGUILAR-...	EHS		$400 pp$	
767 ± 3	2935	25 CAPRARO 87	SPEC	–	$200 \pi^- Cu \rightarrow \pi^- \pi^0 Cu$	
761 ± 5	967	25 CAPRARO 87	SPEC	–	$200 \pi^- Pb \rightarrow \pi^- \pi^0 Pb$	OCCUR=2
771 ± 4		HUSTON 86	SPEC	+	$202 \pi^+ A \rightarrow \pi^+ \pi^0 A$	
766 ± 7	6500	26 BYERLY 73	OSPK	–	$5 \pi^- p$	
766.8±1.5	9650	27 PISUT 68	RVUE	–	$1.7-3.2 \pi^- p, t < 10$	
767 ± 6	900	25 EISNER 67	HBC	–	$4.2 \pi^- p, t < 10$	

NODE=M009M2
NODE=M009M2

NODE=M009M3

NEUTRAL ONLY, PHOTOPRODUCED

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
769.0± 1.0 OUR AVERAGE				
[768.5 ± 1.1 MeV OUR 2012 AVERAGE]				
771 ± 2 +2 -1	63.5k	28 ABRAMOWICZ12	ZEUS	$e p \rightarrow e \pi^+ \pi^- p$
770 ± 2 ±1	79k	29 BREITWEG	98B ZEUS	50–100 γp
767.6± 2.7		BARTALUCCI 78	CNTR	$\gamma p \rightarrow e^+ e^- p$
775 ± 5		GLADDING 73	CNTR	2.9–4.7 γp
767 ± 4	1930	BALLAM 72	HBC	2.8 γp
770 ± 4	2430	BALLAM 72	HBC	4.7 γp
765 ± 10		ALVENSLEB... 70	CNTR	$\gamma A, t < 0.01$
767.7± 1.9	140k	BIGGS 70	CNTR	<4.1 $\gamma C \rightarrow \pi^+ \pi^- C$
765 ± 5	4000	ASBURY 67B	CNTR	$\gamma + Pb$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
771 ± 2	79k	30 BREITWEG	98B ZEUS	50–100 γp

NODE=M009M0P

NODE=M009M0P

NEW

OCCUR=2

OCCUR=2

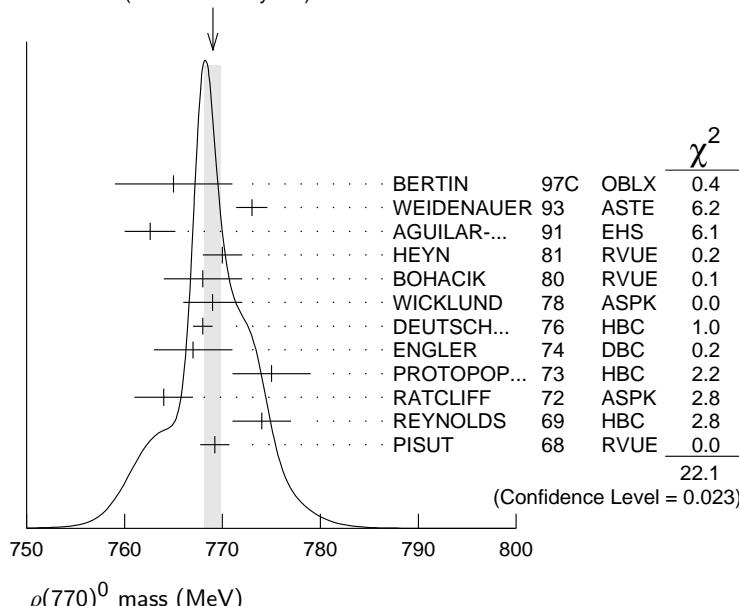
NEUTRAL ONLY, OTHER REACTIONS

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	CHG	COMMENT
769.0±0.9 OUR AVERAGE					
Error includes scale factor of 1.4. See the ideogram below.					
765 ± 6		BERTIN 97C OBLX		0.0	$\bar{p} p \rightarrow \pi^+ \pi^- \pi^0$
773 ± 1.6		WEIDENAUER 93 ASTE			$\bar{p} p \rightarrow \pi^+ \pi^- \omega$
762.6±2.6		AGUILAR-... 91 EHS		400	$p p$
770 ± 2		31 HEYN 81 RVUE			Pion form factor
768 ± 4		32,33 BOHACIK 80 RVUE	0		
769 ± 3		26 WICKLUND 78 ASPK	0		3,4,6 $\pi^\pm N$
768 ± 1	76000	DEUTSCH...	76 HBC	0	16 $\pi^+ p$
767 ± 4	4100	ENGLER 74 DBC	0		6 $\pi^+ n \rightarrow \pi^+ \pi^- p$
775 ± 4	32000	32 PROTOPOP... 73 HBC	0		7.1 $\pi^+ p, t < 0.4$
764 ± 3	6800	RATCLIFF 72 ASPK	0		15 $\pi^- p, t < 0.3$
774 ± 3	1700	REYNOLDS 69 HBC	0		2.26 $\pi^- p$
769.2±1.5	13300	34 PISUT 68 RVUE	0		1.7–3.2 $\pi^- p, t < 10$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
773.5±2.5		35 COLANGELO 01 RVUE			$\pi\pi \rightarrow \pi\pi$
762.3±0.5±1.2	600k	36 ABELE 99E CBAR	0		0.0 $\bar{p} p \rightarrow \pi^+ \pi^- \pi^0$
777 ± 2	4943	37 ADAMS 97 E665			470 $\mu p \rightarrow \mu XB$
770 ± 2		38 BOGOLYUB... 97 MIRA			32 $\bar{p} p \rightarrow \pi^+ \pi^- X$
768 ± 8		38 BOGOLYUB... 97 MIRA			32 $p p \rightarrow \pi^+ \pi^- X$
761.1±2.9		DUBNICKA 89 RVUE			π form factor
777.4±2.0		39 CHABAUD 83 ASPK	0		17 $\pi^- p$ polarized
769.5±0.7		32,33 LANG 79 RVUE	0		
770 ± 9		33 ESTABROOKS 74 RVUE	0		17 $\pi^- p \rightarrow \pi^+ \pi^- n$
773.5±1.7	11200	25 JACOBS 72 HBC	0		2.8 $\pi^- p$
775 ± 3	2250	HYAMS 68 OSPK	0		11.2 $\pi^- p$

NODE=M009M0R

NODE=M009M0R

WEIGHTED AVERAGE
769.0±0.9 (Error scaled by 1.4)



- 1 Using the GOUNARIS 68 parametrization with the complex phase of the $\rho - \omega$ interference and leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.
- 2 A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.
- 3 Supersedes ACHASOV 05A.
- 4 A fit of the SND data from 400 to 1000 MeV using parameters of the $\rho(1450)$ and $\rho(1700)$ from a fit of the data of BARKOV 85, BISELLO 89 and ANDERSON 00A.
- 5 Using the GOUNARIS 68 parametrization with the complex phase of the $\rho - \omega$ interference.
- 6 Update of AKHMETSHIN 02.
- 7 Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$.
- 8 From the GOUNARIS 68 parametrization of the pion form factor.
- 9 Assuming $m_{\rho^+} = m_{\rho^-} = m_{\rho^0}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-} = \Gamma_{\rho^0}$.
- 10 Without limitations on masses and widths.
- 11 Assuming $m_{\rho^0} = m_{\rho^\pm}$, $g_{\rho^0 \pi\pi} = g_{\rho^\pm \pi\pi}$.
- 12 Using the data of BARKOV 85 in the hidden local symmetry model.
- 13 From the fit to $e^+ e^- \rightarrow \pi^+ \pi^-$ data from the compilations of HEYN 81 and BARKOV 85, including the GOUNARIS 68 parametrization of the pion form factor.
- 14 A fit of BARKOV 85 data assuming the direct $\omega \pi\pi$ coupling.
- 15 Applying the S-matrix formalism to the BARKOV 85 data.
- 16 Includes BARKOV 85 data. Model-dependent width definition.
- 17 $|F_\pi(0)|^2$ fixed to 1.
- 18 From the GOUNARIS 68 parametrization of the pion form factor.
- 19 The error combines statistical and systematic uncertainties. Supersedes BARATE 97M.
- 20 $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively.
- 21 From the GOUNARIS 68 parametrization of the pion form factor. The second error is a model error taking into account different parametrizations of the pion form factor.
- 22 Using the data of BARATE 97M and the effective chiral Lagrangian.
- 23 From a fit of the model-independent parameterization of the pion form factor to the data of BARATE 97M.
- 24 Assuming the equality of ρ^+ and ρ^- masses and widths.
- 25 Mass errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.
- 26 Phase shift analysis. Systematic errors added corresponding to spread of different fits.
- 27 From fit of 3-parameter relativistic P -wave Breit-Wigner to total mass distribution. Includes BATON 68, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, BLIEDEN 65 and CARMONY 64.
- 28 Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho - \omega$ interference.
- 29 From the parametrization according to SOEDING 66.
- 30 From the parametrization according to ROSS 66.
- 31 HEYN 81 includes all spacelike and timelike F_π values until 1978.
- 32 From pole extrapolation.
- 33 From phase shift analysis of GRAYER 74 data.
- 34 Includes MALAMUD 69, ARMENISE 68, BACON 67, HUWE 67, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, GOLDHABER 64, ABOLINS 63.
- 35 Breit-Wigner mass from a phase-shift analysis of HYAMS 73 and PROTOPOPESCU 73 data.
- 36 Using relativistic Breit-Wigner and taking into account $\rho - \omega$ interference.
- 37 Systematic errors not evaluated.
- 38 Systematic effects not studied.
- 39 From fit of 3-parameter relativistic Breit-Wigner to helicity-zero part of P -wave intensity. CHABAUD 83 includes data of GRAYER 74.

$m_{\rho(770)^0} - m_{\rho(770)^\pm}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
-0.7 ± 0.8 OUR AVERAGE					Error includes scale factor of 1.5. See the ideogram below.
-2.4 ± 0.8	40	SCHAEL	05C	ALEP	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$
$0.4 \pm 0.7 \pm 0.6$	1.98M	41 ALOISIO	03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$1.3 \pm 1.1 \pm 2.0$	500k	41 ACHASOV	02	SND	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$1.6 \pm 0.6 \pm 1.7$	600k	ABELE	99E	CBAR	$0 \pm 0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
-4 ± 4	3000	42 REYNOLDS	69	HBC	$-0 2.26 \pi^- p$
-5 ± 5	3600	42 FOSTER	68	HBC	$\pm 0 0.0 \bar{p}p$
2.4 ± 2.1	22950	43 PISUT	68	RVUE	$\pi N \rightarrow \rho N$

NODE=M009M0;LINKAGE=LE

NODE=M009M0;LINKAGE=AK
 NODE=M009M0;LINKAGE=AC
 NODE=M009M0;LINKAGE=SN

NODE=M009M5;LINKAGE=GS
 NODE=M009M5;LINKAGE=PT

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 NODE=M009M;LINKAGE=K

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 NODE=M009M;LINKAGE=WO

NODE=M009M;LINKAGE=HC
 NODE=M009M;LINKAGE=K2
 NODE=M009M;LINKAGE=G8

NODE=M009M;LINKAGE=AB
 NODE=M009M;LINKAGE=AA
 NODE=M009M;LINKAGE=F
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 NODE=M009M5;LINKAGE=GO
 NODE=M009M5;LINKAGE=SC
 NODE=M009M;LINKAGE=A6
 NODE=M009M;LINKAGE=K1

NODE=M009M5;LINKAGE=Z
 NODE=M009M;LINKAGE=PC

NODE=M009M;LINKAGE=LB
 NODE=M009M;LINKAGE=Z
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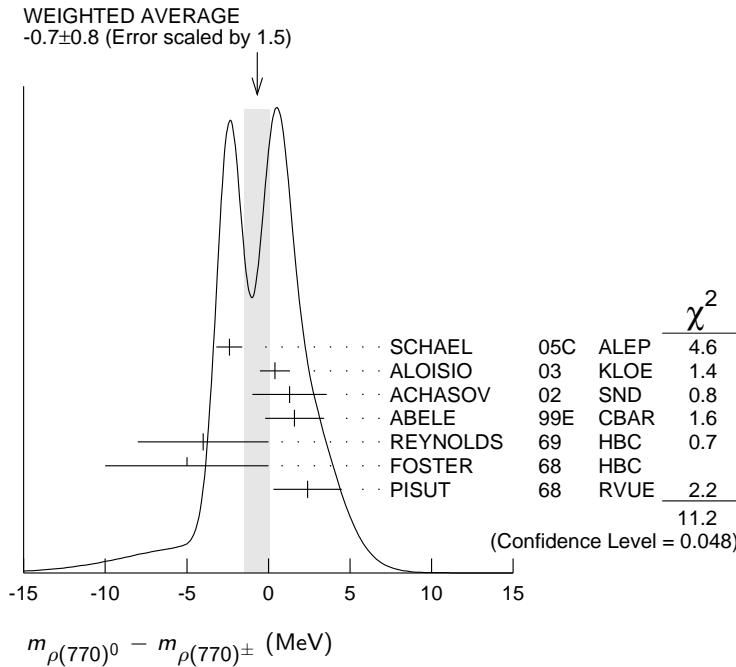
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 NODE=M009M;LINKAGE=A1
 NODE=M009M;LINKAGE=QQ
 NODE=M009M;LINKAGE=G

NODE=M009D

NODE=M009D

- 40 From the combined fit of the τ^- data from ANDERSON 00A and SCHael 05C and e^+e^- data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. Supersedes BARATE 97M.
- 41 Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$.
- 42 From quoted masses of charged and neutral modes.
- 43 Includes MALAMUD 69, ARMENISE 68, BATON 68, BACON 67, HUWE 67, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, BLIEDEN 65, CARMONY 64, GOLDHABER 64, ABOLINS 63.



$m_{\rho(770)^+} = m_{\rho(770)^-}$				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.5 \pm 0.8 \pm 0.7$	1.98M	44 ALOISIO	03 KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

44 Without limitations on masses and widths.

$\rho(770)$ RANGE PARAMETER

The range parameter R enters an energy-dependent correction to the width, of the form $(1 + q_f^2 R^2) / (1 + q^2 R^2)$, where q is the momentum of one of the pions in the $\pi\pi$ rest system. At resonance, $q = q_f$.

VALUE (GeV^{-1})	DOCUMENT ID	TECN	CHG	COMMENT
$5.3^{+0.9}_{-0.7}$	CHABAUD 83	ASPK	0	$17 \pi^- p$ polarized

$\rho(770)$ WIDTH

We no longer list S-wave Breit-Wigner fits, or data with high combinatorial background.

NEUTRAL ONLY, e^+e^-

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
147.8 ± 0.9 OUR AVERAGE					Error includes scale factor of 2.0. See the ideogram below. [146.2 ± 0.7 MeV OUR 2012 AVERAGE Scale factor = 1.1]
149.59 ± 0.67	45 LEES	12G BABR			$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
145.98 ± 0.75 ± 0.50	900k	46 AKHMETSHIN 07			$e^+ e^- \rightarrow \pi^+ \pi^-$
146.1 ± 0.8 ± 1.5	800k	47,48 ACHASOV 06	SND		$e^+ e^- \rightarrow \pi^+ \pi^-$
143.85 ± 1.33 ± 0.80	114k	49,50 AKHMETSHIN 04	CMD2		$e^+ e^- \rightarrow \pi^+ \pi^-$

NODE=M009D;LINKAGE=SC

NODE=M009D;LINKAGE=CH

NODE=M009D;LINKAGE=A

NODE=M009D;LINKAGE=R

NODE=M009D1

NODE=M009D1

NODE=M009D;LINKAGE=WO

NODE=M009R

NODE=M009R

NODE=M009R

NODE=M009220

NODE=M009220

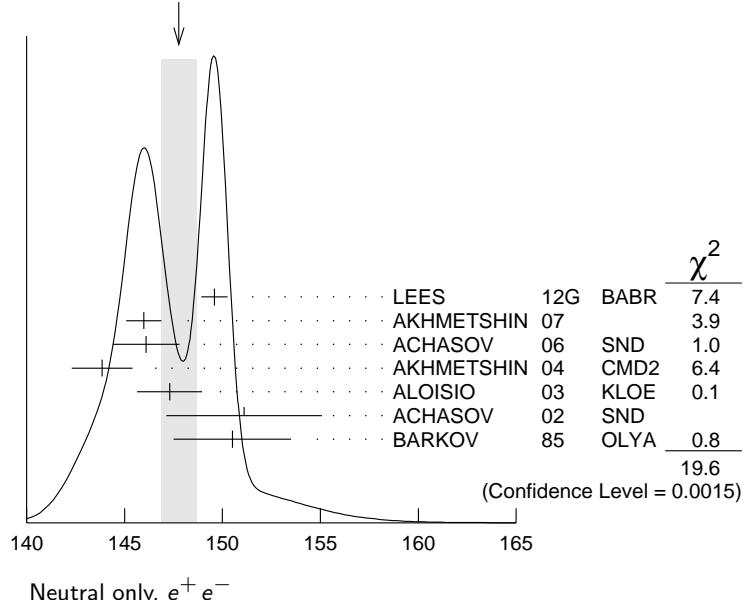
NODE=M009W0

NODE=M009W0

NEW

$147.3 \pm 1.5 \pm 0.7$	1.98M	51 ALOISIO	03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
$151.1 \pm 2.6 \pm 3.0$	500k	51 ACHASOV	02	SND	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
150.5 ± 3.0		52 BARKOV	85	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^-$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
$143.9 \pm 1.3 \pm 1.1$	1.98M	53 ALOISIO	03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=2
$147.4 \pm 1.5 \pm 0.7$	1.98M	54 ALOISIO	03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=3
$149.8 \pm 2.2 \pm 2.0$	500k	55 ACHASOV	02	SND	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=3
$147.9 \pm 1.5 \pm 7.5$		56 BENAYOUN	98	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$, $\mu^+ \mu^-$	
$153.5 \pm 1.3 \pm 4.6$		57 GARDNER	98	RVUE	$0.28-0.92 e^+ e^- \rightarrow \pi^+ \pi^-$	
145.0 ± 1.7		58 O'CONNELL	97	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	
142.5 ± 3.5		59 BERNICHA	94	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	
138 ± 1		60 GESHKEN...	89	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	

WEIGHTED AVERAGE
 147.8 ± 0.9 (Error scaled by 2.0)



Neutral only, $e^+ e^-$

CHARGED ONLY, τ DECAYS and $e^+ e^-$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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NODE=M009W5
NODE=M009W5

149.1±0.8 OUR FIT

149.1±0.8 OUR AVERAGE

$148.1 \pm 0.4 \pm 1.7$	5.4M	61,62 FUJIKAWA	08	BELL	$\pm \tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
149.0 ± 1.2		62,63 SCHAEL	05C	ALEP	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
$149.9 \pm 2.3 \pm 2.0$	500k	51 ACHASOV	02	SND	$\pm 1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=2
$150.4 \pm 1.4 \pm 1.4$	87k	64,65 ANDERSON	00A	CLE2	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
$143.7 \pm 1.3 \pm 1.2$	1.98M	51 ALOISIO	03	KLOE	$\pm 1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
$142.9 \pm 1.3 \pm 1.4$	1.98M	54 ALOISIO	03	KLOE	$- 1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=2
$144.7 \pm 1.4 \pm 1.2$	1.98M	54 ALOISIO	03	KLOE	$+ 1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=3
$150.2 \pm 2.0^{+0.7}_{-1.6}$		66 SANZ-CILLERO03	RVUE		$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
$150.9 \pm 2.2 \pm 2.0$	500k	55 ACHASOV	02	SND	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	OCCUR=4

MIXED CHARGES, OTHER REACTIONS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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NODE=M009W7
NODE=M009W7

149.5±1.3	600k	67 ABELE	99E	CBAR	$0\pm 0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
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CHARGED ONLY, HADROPRODUCED

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
150.2± 2.4 OUR FIT					
150.2± 2.4 OUR AVERAGE					
152.8± 4.3		ABELE	97	CBAR	$\bar{p}n \rightarrow \pi^- \pi^0 \pi^0$
155 ± 11	2935	68 CAPRARO	87	SPEC	- 200 $\pi^- \text{Cu} \rightarrow \pi^- \pi^0 \text{Cu}$
154 ± 20	967	68 CAPRARO	87	SPEC	- 200 $\pi^- \text{Pb} \rightarrow \pi^- \pi^0 \text{Pb}$
150 ± 5		HUSTON	86	SPEC	+ 202 $\pi^+ \text{A} \rightarrow \pi^+ \pi^0 \text{A}$
146 ± 12	6500	69 BYERLY	73	OSPK	- 5 $\pi^- p$
148.2± 4.1	9650	70 PISUT	68	RVUE	- 1.7–3.2 $\pi^- p$, $t < 10$
146 ± 13	900	EISNER	67	HBC	- 4.2 $\pi^- p$, $t < 10$

NODE=M009W2

NODE=M009W2

NEUTRAL ONLY, PHOTOPRODUCED

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
151.7± 2.6 OUR AVERAGE				
[150.7 ± 2.9 MeV OUR 2012 AVERAGE]				

155 ± 5 ± 2	63.5k	71 ABRAMOWICZ12	ZEUS	$e p \rightarrow e \pi^+ \pi^- p$
146 ± 3 ± 13	79k	72 BREITWEG	98B ZEUS	50–100 γp
150.9± 3.0		BARTALUCCI	78 CNTR	$\gamma p \rightarrow e^+ e^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
138 ± 3	79k	73 BREITWEG	98B ZEUS	50–100 γp
147 ± 11		GLADDING	73 CNTR	2.9–4.7 γp
155 ± 12	2430	BALLAM	72 HBC	4.7 γp
145 ± 13	1930	BALLAM	72 HBC	2.8 γp
140 ± 5		ALVENSLEB...	70 CNTR	γA , $t < 0.01$
146.1± 2.9	140k	BIGGS	70 CNTR	<4.1 $\gamma C \rightarrow \pi^+ \pi^- C$
160 ± 10		LANZEROTTI	68 CNTR	γp
130 ± 5	4000	ASBURY	67B CNTR	$\gamma + Pb$

NODE=M009W0P

NODE=M009W0P

NEW

NEUTRAL ONLY, OTHER REACTIONS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
150.9± 1.7 OUR AVERAGE					

150.9± 1.7 OUR AVERAGE				Error includes scale factor of 1.1.	
122 ± 20		BERTIN	97C OBLX	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$	
145.7± 5.3		WEIDENAUER	93 ASTE	$\bar{p}p \rightarrow \pi^+ \pi^- \omega$	
144.9± 3.7		DUBNICKA	89 RVUE	π form factor	
148 ± 6	74,75 BOHACIK	80 RVUE	0		
152 ± 9	69 WICKLUND	78 ASPK	0	$3,4,6 \pi^\pm p N$	
154 ± 2	76000 DEUTSCH...	76 HBC	0	16 $\pi^+ p$	
157 ± 8	6800 RATCLIFF	72 ASPK	0	15 $\pi^- p$, $t < 0.3$	
143 ± 8	1700 REYNOLDS	69 HBC	0	2.26 $\pi^- p$	

NODE=M009W0R

NODE=M009W0R

• • • We do not use the following data for averages, fits, limits, etc. • • •

147.0± 2.5	600k	76 ABELE	99E CBAR	0	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
146 ± 3	4943	77 ADAMS	97 E665		$470 \mu p \rightarrow \mu XB$
160.0± 4.1		78 CHABAUD	83 ASPK	0	17 $\pi^- p$ polarized
155 ± 1		79 HEYN	81 RVUE	0	π form factor
148.0± 1.3	74,75 LANG	79 RVUE	0		
146 ± 14	4100 ENGLER	74 DBC	0	$6 \pi^+ n \rightarrow \pi^+ \pi^- p$	
143 ± 13	75 ESTABROOKS	74 RVUE	0	$17 \pi^- p \rightarrow \pi^+ \pi^- n$	
160 ± 10	32000 PROTPOP...	73 HBC	0	7.1 $\pi^+ p$, $t < 0.4$	
145 ± 12	2250 HYAMS	68 OSPK	0	11.2 $\pi^- p$	
163 ± 15	13300 PISUT	68 RVUE	0	1.7–3.2 $\pi^- p$, $t < 10$	

NODE=M009W0;LINKAGE=LE

45 Using the GOUNARIS 68 parametrization with the complex phase of the ρ – ω interference and leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.

46 A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.

47 Supersedes ACHASOV 05A.

48 A fit of the SND data from 400 to 1000 MeV using parameters of the $\rho(1450)$ and $\rho(1700)$ from a fit of the data of BARKOV 85, BISELLO 89 and ANDERSON 00A.49 Using the GOUNARIS 68 parametrization with the complex phase of the ρ – ω interference.

50 From a fit in the energy range 0.61 to 0.96 GeV. Update of AKHMETSHIN 02.

51 Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$.

52 From the GOUNARIS 68 parametrization of the pion form factor.

53 Assuming $m_{\rho^+} = m_{\rho^-} = m_{\rho^0}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-} = \Gamma_{\rho^0}$.

54 Without limitations on masses and widths.

55 Assuming $m_{\rho^0} = m_{\rho^\pm}$, $g_{\rho^0 \pi \pi} = g_{\rho^\pm \pi \pi}$.

NODE=M009W;LINKAGE=AK

NODE=M009W0;LINKAGE=AC

NODE=M009W0;LINKAGE=SN

NODE=M009W5;LINKAGE=GS

NODE=M009W5;LINKAGE=P2

NODE=M009W;LINKAGE=CH

NODE=M009W;LINKAGE=K

NODE=M009W;LINKAGE=DF

NODE=M009W;LINKAGE=WO

NODE=M009W;LINKAGE=HC

- 56 Using the data of BARKOV 85 in the hidden local symmetry model.
 57 From the fit to $e^+ e^- \rightarrow \pi^+ \pi^-$ data from the compilations of HEYN 81 and BARKOV 85, including the GOUNARIS 68 parametrization of the pion form factor.
 58 A fit of BARKOV 85 data assuming the direct $\omega \pi \pi$ coupling.
 59 Applying the S-matrix formalism to the BARKOV 85 data.
 60 Includes BARKOV 85 data. Model-dependent width definition.
 61 $|F_\pi(0)|^2$ fixed to 1.
 62 From the GOUNARIS 68 parametrization of the pion form factor.
 63 The error combines statistical and systematic uncertainties. Supersedes BARATE 97M.
 64 $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively.
 65 From the GOUNARIS 68 parametrization of the pion form factor. The second error is a model error taking into account different parametrizations of the pion form factor.
 66 Using the data of BARATE 97M and the effective chiral Lagrangian.
 67 Assuming the equality of ρ^+ and ρ^- masses and widths.
 68 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
 69 Phase shift analysis. Systematic errors added corresponding to spread of different fits.
 70 From fit of 3-parameter relativistic P -wave Breit-Wigner to total mass distribution. Includes BATON 68, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, BLIEDEN 65 and CARMONY 64.
 71 Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho-\omega$ interference.
 72 From the parametrization according to SOEDING 66.
 73 From the parametrization according to ROSS 66.
 74 From pole extrapolation.
 75 From phase shift analysis of GRAYER 74 data.
 76 Using relativistic Breit-Wigner and taking into account $\rho-\omega$ interference.
 77 Systematic errors not evaluated.
 78 From fit of 3-parameter relativistic Breit-Wigner to helicity-zero part of P -wave intensity. CHABAUD 83 includes data of GRAYER 74.
 79 HEYN 81 includes all spacelike and timelike F_π values until 1978.
 80 Includes MALAMUD 69, ARMENISE 68, BACON 67, HUWE 67, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, GOLDHABER 64, ABOLINS 63.

$\Gamma_{\rho(770)^0} - \Gamma_{\rho(770)^\pm}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.3±1.3 OUR AVERAGE				Error includes scale factor of 1.4.
-0.2±1.0	81 SCHAEL	05C ALEP	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
3.6±1.8±1.7	1.98M 82 ALOISIO	03 KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	

$\Gamma_{\rho(770)^+} - \Gamma_{\rho(770)^-}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.8±2.0±0.5	1.98M 83 ALOISIO	03 KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	

81 From the combined fit of the τ^- data from ANDERSON 00A and SCHAEL 05C and $e^+ e^-$ data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. Supersedes BARATE 97M.

82 Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$.

83 Without limitations on masses and widths.

$\rho(770)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
$\Gamma_1 \pi \pi$	~ 100	%
$\rho(770)^\pm$ decays		
$\Gamma_2 \pi^\pm \pi^0$	~ 100	%
$\Gamma_3 \pi^\pm \gamma$	(4.5 ± 0.5)	$\times 10^{-4}$ S=2.2
$\Gamma_4 \pi^\pm \eta$	< 6	$\times 10^{-3}$ CL=84%
$\Gamma_5 \pi^\pm \pi^+ \pi^- \pi^0$	< 2.0	$\times 10^{-3}$ CL=84%

NODE=M009W;LINKAGE=K2

NODE=M009W;LINKAGE=G8

NODE=M009W;LINKAGE=AB

NODE=M009W;LINKAGE=AA

NODE=M009W;LINKAGE=F

NODE=M009W5;LINKAGE=FU

NODE=M009W5;LINKAGE=GO

NODE=M009W5;LINKAGE=SC

NODE=M009W;LINKAGE=A6

NODE=M009W;LINKAGE=K1

NODE=M009W5;LINKAGE=Z

NODE=M009W;LINKAGE=LB

NODE=M009W;LINKAGE=Z

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NODE=M009W;LINKAGE=A

NODE=M009W0P;LINKAGE=AB

NODE=M009W;LINKAGE=B5

NODE=M009W;LINKAGE=B6

NODE=M009W;LINKAGE=C

NODE=M009W;LINKAGE=H

NODE=M009W;LINKAGE=BL

NODE=M009W;LINKAGE=A1

NODE=M009W;LINKAGE=G

NODE=M009W;LINKAGE=B

NODE=M009W;LINKAGE=R

NODE=M009W6

NODE=M009W6

NODE=M009W16

NODE=M009W16

NODE=M009W6;LINKAGE=SC

NODE=M009W6;LINKAGE=CH

NODE=M009W16;LINKAGE=WO

NODE=M009225;NODE=M009

DESIG=1;OUR EVAL;→ UNCHECKED ←

NODE=M009;CLUMP=A

DESIG=11;OUR EVAL;→ UNCHECKED ←

DESIG=3

DESIG=5

DESIG=21

$\rho(770)^0$ decays

Γ_6	$\pi^+ \pi^-$	~ 100	%
Γ_7	$\pi^+ \pi^- \gamma$	(9.9 \pm 1.6)	$\times 10^{-3}$
Γ_8	$\pi^0 \gamma$	(6.0 \pm 0.8)	$\times 10^{-4}$
Γ_9	$\eta \gamma$	(3.00 \pm 0.20)	$\times 10^{-4}$
Γ_{10}	$\pi^0 \pi^0 \gamma$	(4.5 \pm 0.8)	$\times 10^{-5}$
Γ_{11}	$\mu^+ \mu^-$	[a] (4.55 \pm 0.28)	$\times 10^{-5}$
Γ_{12}	$e^+ e^-$	[a] (4.72 \pm 0.05)	$\times 10^{-5}$
Γ_{13}	$\pi^+ \pi^- \pi^0$	(1.01 $^{+0.54}_{-0.36} \pm 0.34$)	$\times 10^{-4}$
Γ_{14}	$\pi^+ \pi^- \pi^+ \pi^-$	(1.8 \pm 0.9)	$\times 10^{-5}$
Γ_{15}	$\pi^+ \pi^- \pi^0 \pi^0$	(1.6 \pm 0.8)	$\times 10^{-5}$
Γ_{16}	$\pi^0 e^+ e^-$	< 1.2	$\times 10^{-5}$ CL=90%
Γ_{17}	$\eta e^+ e^-$		

- [a] The $\omega\rho$ interference is then due to $\omega\rho$ mixing only, and is expected to be small. If $e\mu$ universality holds, $\Gamma(\rho^0 \rightarrow \mu^+ \mu^-) = \Gamma(\rho^0 \rightarrow e^+ e^-) \times 0.99785$.

NODE=M009;CLUMP=B
DESIG=12;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=60
DESIG=40
DESIG=8
DESIG=80
DESIG=6
DESIG=4
DESIG=4
DESIG=7;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=22
DESIG=30
DESIG=9
DESIG=10

LINKAGE=MD2

CONSTRAINED FIT INFORMATION

An overall fit to the total width and a partial width uses 10 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 10.7$ for 8 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|cc} x_3 & -100 & \\ \hline \Gamma & 15 & -15 \\ & x_2 & x_3 \end{array}$$

	Mode	Rate (MeV)	Scale factor
Γ_2	$\pi^\pm \pi^0$	150.2 \pm 2.4	
Γ_3	$\pi^\pm \gamma$	0.068 \pm 0.007	2.3

DESIG=11
DESIG=3

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and 7 branching ratios uses 21 measurements and one constraint to determine 9 parameters. The overall fit has a $\chi^2 = 6.0$ for 13 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{14}	Γ
	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{14}
x_7	-100							
x_8	-5	0						
x_9	-1	0	1					
x_{10}	-1	0	0	0				
x_{11}	2	-3	0	0	0			
x_{12}	0	0	-8	-9	0	0		
x_{14}	-1	0	0	0	0	0	0	
Γ	0	0	4	5	0	0	-54	0

Mode		Rate (MeV)		
Γ_6	$\pi^+ \pi^-$	147.5	± 0.9	DESIG=12
Γ_7	$\pi^+ \pi^- \gamma$	1.48	± 0.24	DESIG=60
Γ_8	$\pi^0 \gamma$	0.089	± 0.012	DESIG=40
Γ_9	$\eta \gamma$	0.0447	± 0.0031	DESIG=8
Γ_{10}	$\pi^0 \pi^0 \gamma$	0.0066	± 0.0012	DESIG=80
Γ_{11}	$\mu^+ \mu^-$	[a] 0.0068	± 0.0004	DESIG=6
Γ_{12}	$e^+ e^-$	[a] 0.00704	± 0.00006	DESIG=4
Γ_{14}	$\pi^+ \pi^- \pi^+ \pi^-$	0.0027	± 0.0014	DESIG=22

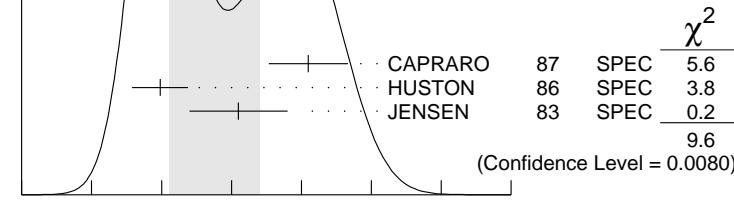
$\rho(770)$ PARTIAL WIDTHS

$\Gamma(\pi^\pm \gamma)$

VALUE (keV)	DOCUMENT ID	TECN	CHG	COMMENT
68 ± 7 OUR FIT	Error includes scale factor of 2.3.			
68 ± 7 OUR AVERAGE	Error includes scale factor of 2.2. See the ideogram below.			
81 ± 4 ± 4	CAPRARO	87	SPEC	-
59.8 ± 4.0	HUSTON	86	SPEC	+
71 ± 7	JENSEN	83	SPEC	-
				200 $\pi^- A \rightarrow \pi^- \pi^0 A$
				202 $\pi^+ A \rightarrow \pi^+ \pi^0 A$
				156–260 $\pi^- A \rightarrow \pi^- \pi^0 A$

WEIGHTED AVERAGE
68 ± 7 (Error scaled by 2.2)

Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.



NODE=M009230

NODE=M009W3
NODE=M009W3

$\Gamma(e^+e^-)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{12}
7.04 ± 0.06 OUR FIT					
7.04 ± 0.06 OUR AVERAGE					
7.048 ± 0.057 ± 0.050	900k	84 AKHMETSHIN 07		$e^+e^- \rightarrow \pi^+\pi^-$	
7.06 ± 0.11 ± 0.05	114k	85,86 AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-$	
6.77 ± 0.10 ± 0.30		BARKOV 85	OLYA	$e^+e^- \rightarrow \pi^+\pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
7.12 ± 0.02 ± 0.11	800k	87 ACHASOV 06	SND	$e^+e^- \rightarrow \pi^+\pi^-$	
6.3 ± 0.1		88 BENAYOUN 98	RVUE	$e^+e^- \rightarrow \pi^+\pi^-, \mu^+\mu^-$	

 Γ_{12}

NODE=M009W4
NODE=M009W4

OCCUR=2

 $\Gamma(\pi^0\gamma)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_8
• • • We do not use the following data for averages, fits, limits, etc. • • •					
77 ± 17 ± 11	36500	89 ACHASOV 03	SND	$0.60-0.97 e^+e^- \rightarrow \pi^0\gamma$	
121 ± 31		DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$	

 Γ_8

NODE=M009W31
NODE=M009W31

 $\Gamma(\eta\gamma)$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT	Γ_9
• • • We do not use the following data for averages, fits, limits, etc. • • •				
62 ± 17	90 DOLINSKY 89	ND	$e^+e^- \rightarrow \eta\gamma$	

 Γ_9

NODE=M009W32
NODE=M009W32

 $\Gamma(\pi^+\pi^-\pi^+\pi^-)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{14}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.8 ± 1.4 ± 0.5	153	AKHMETSHIN 00	CMD2	$0.6-0.97 e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$	
84		A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.			
85		Using the GOUNARIS 68 parametrization with the complex phase of the ρ - ω interference.			
86		From a fit in the energy range 0.61 to 0.96 GeV. Update of AKHMETSHIN 02.			
87		Supersedes ACHASOV 05A.			
88		Using the data of BARKOV 85 in the hidden local symmetry model.			
89		Using $\Gamma_{\text{total}} = 147.9 \pm 1.3$ MeV and $B(\rho \rightarrow \pi^0\gamma)$ from ACHASOV 03.			
90		Solution corresponding to constructive ω - ρ interference.			

 Γ_{14}

NODE=M009W33
NODE=M009W33

NODE=M009W4;LINKAGE=AK
NODE=M009W4;LINKAGE=GS
NODE=M009W4;LINKAGE=P2
NODE=M009W4;LINKAGE=AC
NODE=M009W4;LINKAGE=K2
NODE=M009W31;LINKAGE=AV
NODE=M009W32;LINKAGE=L

 $\rho(770) \Gamma(e^+e^-)\Gamma(i)/\Gamma^2(\text{total})$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{12}/\Gamma \times \Gamma_6/\Gamma$
4.876 ± 0.023 ± 0.064	800k	91,92 ACHASOV 06	SND	$e^+e^- \rightarrow \pi^+\pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.72 ± 0.02		93 BENAYOUN 10	RVUE	$0.4-1.05 e^+e^-$	
91		Supersedes ACHASOV 05A.			
92		A fit of the SND data from 400 to 1000 MeV using parameters of the $\rho(1450)$ and $\rho(1700)$ from a fit of the data of BARKOV 85, BISELLO 89 and ANDERSON 00A.			
93		A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.			

 $\Gamma_{12}/\Gamma \times \Gamma_6/\Gamma$

NODE=M009233

NODE=M009G4
NODE=M009G4

 $\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{12}/\Gamma \times \Gamma_9/\Gamma$
1.42 ± 0.10 OUR FIT					
1.45 ± 0.12 OUR AVERAGE					
1.32 ± 0.14 ± 0.08	33k	94 ACHASOV 07B	SND	$0.6-1.38 e^+e^- \rightarrow \eta\gamma$	
1.50 ± 0.65 ± 0.09	17.4k	95 AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \eta\gamma$	
1.61 ± 0.20 ± 0.11	23k	96,97 AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$	
1.85 ± 0.49		98 DOLINSKY 89	ND	$e^+e^- \rightarrow \eta\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.05 ± 0.02		99 BENAYOUN 10	RVUE	$0.4-1.05 e^+e^-$	
94		From a combined fit of $\sigma(e^+e^- \rightarrow \eta\gamma)$ with $\eta \rightarrow 3\pi^0$ and $\eta \rightarrow \pi^+\pi^-\pi^0$, and fixing $B(\eta \rightarrow 3\pi^0) / B(\eta \rightarrow \pi^+\pi^-\pi^0) = 1.44 \pm 0.04$. Recalculated by us from the cross section at the peak. Supersedes ACHASOV 00D and ACHASOV 06A.			
95		From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.			
96		From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.			
97		The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively).			
98		Recalculated by us from the cross section in the peak.			
99		A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.			

 $\Gamma_{12}/\Gamma \times \Gamma_9/\Gamma$

NODE=M009G4;LINKAGE=AC
NODE=M009G4;LINKAGE=SN

NODE=M009G4;LINKAGE=BE

NODE=M009G1
NODE=M009G1

NODE=M009G1;LINKAGE=AH

NODE=M009G;LINKAGE=AH
NODE=M009G;LINKAGE=AK
NODE=M009G;LINKAGE=BQ

NODE=M009G;LINKAGE=LP
NODE=M009G1;LINKAGE=BE

$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$					$\Gamma_{12}/\Gamma \times \Gamma_8/\Gamma$	NODE=M009G2 NODE=M009G2
VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT		
2.8 ± 0.4 OUR FIT						
2.8 ± 0.4 OUR AVERAGE						
2.90 $^{+0.60}_{-0.55}$ ± 0.18	18680	AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \pi^0\gamma$		
2.37 ± 0.53 ± 0.33	36500	100 ACHASOV 03	SND	$0.60-0.97 e^+e^- \rightarrow \pi^0\gamma$		
3.61 ± 0.74 ± 0.49	10625	101 DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.875 ± 0.026	102 BENAYOUN 10	RVUE	0.4-1.05 e^+e^-			
100 Using $\sigma_\phi \rightarrow \pi^0\gamma$ from ACHASOV 00 and $m_\rho = 775.97$ MeV in the model with the energy-independent phase of $\rho\omega$ interference equal to $(-10.2 \pm 7.0)^\circ$.						
101 Recalculated by us from the cross section in the peak.						
102 A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.						
$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					$\Gamma_{12}/\Gamma \times \Gamma_{13}/\Gamma$	
VALUE (units 10^{-9})	EVTS	DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.903 ± 0.076	103 BENAYOUN 10	RVUE	0.4-1.05 e^+e^-			
4.58 $^{+2.46}_{-1.64}$ ± 1.56	1.2M 104 ACHASOV 03D	RVUE	$0.44-2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$			
103 A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.						
104 Statistical significance is less than 3σ .						
(770) BRANCHING RATIOS						
$\Gamma(\pi^\pm\eta)/\Gamma(\pi\pi)$					Γ_4/Γ_1	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	CHG	COMMENT	
<60	84	FERBEL	66	HBC	\pm	$\pi^\pm p$ above 2.5
$\Gamma(\pi^\pm\pi^+\pi^-\pi^0)/\Gamma(\pi\pi)$					Γ_5/Γ_1	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	CHG	COMMENT	
<20	84	FERBEL	66	HBC	\pm	$\pi^\pm p$ above 2.5
• • • We do not use the following data for averages, fits, limits, etc. • • •						
35 ± 40	JAMES	66	HBC	+	2.1 $\pi^+ p$	
$\Gamma(\mu^+\mu^-)/\Gamma(\pi^+\pi^-)$					Γ_{11}/Γ_6	
VALUE (units 10^{-5})		DOCUMENT ID	TECN	COMMENT		
4.60±0.28 OUR FIT						
4.6 ± 0.2 ± 0.2		ANTIPOV 89	SIGM	$\pi^- Cu \rightarrow \mu^+\mu^-\pi^- Cu$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
8.2 $^{+1.6}_{-3.6}$	105 ROTHWELL 69	CNTR	Photoproduction			
5.6 ± 1.5	106 WEHMANN 69	OSPK	$12\pi^- C, Fe$			
9.7 $^{+3.1}_{-3.3}$	107 HYAMS 67	OSPK	$11\pi^- Li, H$			
$\Gamma(e^+e^-)/\Gamma(\pi\pi)$					Γ_{12}/Γ_1	
VALUE (units 10^{-4})		DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.40 ± 0.05	108 BENAKSAS 72	OSPK	$e^+e^- \rightarrow \pi^+\pi^-$			
$\Gamma(\eta\gamma)/\Gamma_{\text{total}}$					Γ_9/Γ	
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
3.00±0.21 OUR FIT						
2.90±0.32 OUR AVERAGE						
2.79 $\pm 0.34 \pm 0.03$	33k 109 ACHASOV 07B	SND	$0.6-1.38 e^+e^- \rightarrow \eta\gamma$			
3.6 ± 0.9	110 ANDREWS 77	CNTR	0	$6.7-10 \gamma Cu$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
3.21 $\pm 1.39 \pm 0.20$	17.4 ^{11,112} AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \eta\gamma$			
3.39 $\pm 0.42 \pm 0.23$	110,113, ¹¹⁴ AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$			
1.9 $^{+0.6}_{-0.8}$	115 BENAYOUN 96	RVUE	$0.54-1.04 e^+e^- \rightarrow \eta\gamma$			
4.0 ± 1.1	110, ¹¹² DOLINSKY 89	ND	$e^+e^- \rightarrow \eta\gamma$			

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{\text{total}}$						Γ_{14}/Γ	NODE=M009R13 NODE=M009R13
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1.8 ± 0.9 OUR FIT							
$1.8 \pm 0.9 \pm 0.3$	153		AKHMETSHIN 00	CMD2	$0.6-0.97 e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$		
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
<20	90		KURDADZE 88	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$		
$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma(\pi\pi)$						Γ_{14}/Γ_1	NODE=M009R11 NODE=M009R11
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
<15	90		ERBE 69	HBC	0	$2.5-5.8 \gamma p$	
<20			CHUNG 68	HBC	0	$3.2, 4.2 \pi^- p$	
<20	90		HUSON 68	HLBC	0	$16.0 \pi^- p$	
<80			JAMES 66	HBC	0	$2.1 \pi^+ p$	
$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$						Γ_{13}/Γ	NODE=M009R10 NODE=M009R10
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
$1.01^{+0.54}_{-0.36} \pm 0.34$	1.2M	116	ACHASOV 03D	RVUE	$0.44-2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$		
<1.2	90		VASSERMAN 88B	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$		
$\Gamma(\pi^+\pi^-\pi^0)/\Gamma(\pi\pi)$						Γ_{13}/Γ_1	NODE=M009R6 NODE=M009R6
<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
~ 0.01			BRAMON 86	RVUE	0	$J/\psi \rightarrow \omega \pi^0$	
<0.01	84	117	ABRAMS 71	HBC	0	$3.7 \pi^+ p$	
$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$						Γ_{15}/Γ	NODE=M009R8 NODE=M009R8
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
$1.60 \pm 0.74 \pm 0.18$		118	ACHASOV 09A	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$		
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
< 4	90		AULCHENKO 87C	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$		
<20	90		KURDADZE 86	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$		
$\Gamma(\pi^+\pi^-\gamma)/\Gamma_{\text{total}}$						Γ_7/Γ	NODE=M009R12 NODE=M009R12
<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.0099 ± 0.0016 OUR FIT							
0.0099 ± 0.0016		119	DOLINSKY 91	ND	$e^+e^- \rightarrow \pi^+\pi^-\gamma$		
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
0.0111 ± 0.0014		120	VASSERMAN 88	ND	$e^+e^- \rightarrow \pi^+\pi^-\gamma$		
<0.005	90	121	VASSERMAN 88	ND	$e^+e^- \rightarrow \pi^+\pi^-\gamma$		OCCUR=2
$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$						Γ_8/Γ	NODE=M009R9 NODE=M009R9
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
$6.21^{+1.28}_{-1.18} \pm 0.39$	18680	122,123	AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \pi^0\gamma$		
$5.22 \pm 1.17 \pm 0.75$	36500	123,124	ACHASOV 03	SND	$0.60-0.97 e^+e^- \rightarrow \pi^0\gamma$		
6.8 ± 1.7		125	BENAYOUN 96	RVUE	$0.54-1.04 e^+e^- \rightarrow \pi^0\gamma$		
7.9 ± 2.0		123	DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$		
$\Gamma(\pi^0e^+e^-)/\Gamma_{\text{total}}$						Γ_{16}/Γ	NODE=M009R15 NODE=M009R15
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<1.2	90		ACHASOV 08	SND	$0.36-0.97 e^+e^- \rightarrow \pi^0e^+e^-$		
• • • We do not use the following data for averages, fits, limits, etc.						• • •	
<1.6			AKHMETSHIN 05A	CMD2	$0.72-0.84 e^+e^-$		

$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-5})

DOCUMENT ID

TECN

COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.7

AKHMETSHIN 05A CMD2 0.72-0.84 $e^+ e^-$ $\Gamma(\pi^0 \pi^0 \gamma)/\Gamma_{\text{total}}$ VALUE (units 10^{-5})

EVTS

DOCUMENT ID

TECN

COMMENT

 4.5 ± 0.8 OUR FIT **$4.5^{+0.9}_{-0.8}$ OUR AVERAGE** $5.2^{+1.5}_{-1.3} \pm 0.6$

190

126

AKHMETSHIN 04B

CMD2

 $0.6-0.97 \pi^0 \pi^0 \gamma$ $4.1^{+1.0}_{-0.9} \pm 0.3$

295

127

ACHASOV

02F

SND

 $0.36-0.97 \pi^0 \pi^0 \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

 $4.8^{+3.4}_{-1.8} \pm 0.5$

63

128

ACHASOV

00G

SND

 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$ 105 Possibly large ρ - ω interference leads us to increase the minus error.106 Result contains $11 \pm 11\%$ correction using SU(3) for central value. The error on the correction takes account of possible ρ - ω interference and the upper limit agrees with the upper limit of $\omega \rightarrow \mu^+ \mu^-$ from this experiment.107 HYAMS 67's mass resolution is 20 MeV. The ω region was excluded.108 The ρ' contribution is not taken into account.109 ACHASOV 07B reports $[\Gamma(\rho(770) \rightarrow \eta\gamma)/\Gamma_{\text{total}}] \times [B(\rho(770) \rightarrow e^+ e^-)] = (1.32 \pm 0.14 \pm 0.08) \times 10^{-8}$ which we divide by our best value $B(\rho(770) \rightarrow e^+ e^-) = (4.72 \pm 0.05) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Supersedes ACHASOV 00D and ACHASOV 06A.110 Solution corresponding to constructive ω - ρ interference.111 Using $B(\rho \rightarrow e^+ e^-) = (4.67 \pm 0.09) \times 10^{-5}$ and $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.112 Not independent of the corresponding $\Gamma(e^+ e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.113 The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively).114 Using $B(\rho \rightarrow e^+ e^-) = (4.75 \pm 0.10) \times 10^{-5}$ from AKHMETSHIN 02 and $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.115 Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution. Constructive ρ - ω interference solution.116 Statistical significance is less than 3σ .117 Model dependent, assumes $l = 1, 2$, or 3 for the 3π system.118 Assuming no interference between the ρ and ω contributions.

119 Bremsstrahlung from a decay pion and for photon energy above 50 MeV.

120 Superseded by DOLINSKY 91.

121 Structure radiation due to quark rearrangement in the decay.

122 Using $B(\rho \rightarrow e^+ e^-) = (4.67 \pm 0.09) \times 10^{-5}$.123 Not independent of the corresponding $\Gamma(e^+ e^-) \times \Gamma(\pi^0 \gamma)/\Gamma_{\text{total}}^2$.124 Using $B(\rho \rightarrow e^+ e^-) = (4.54 \pm 0.10) \times 10^{-5}$.

125 Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution.

126 This branching ratio includes the conventional VMD mechanism $\rho \rightarrow \omega\pi^0$, $\omega \rightarrow \pi^0\gamma$, and the new decay mode $\rho \rightarrow f_0(500)\gamma$, $f_0(500) \rightarrow \pi^0\pi^0$ with a branching ratio $(2.0^{+1.1}_{-0.9} \pm 0.3) \times 10^{-5}$ differing from zero by 2.0 standard deviations.127 This branching ratio includes the conventional VMD mechanism $\rho \rightarrow \omega\pi^0$, $\omega \rightarrow \pi^0\gamma$ and the new decay mode $\rho \rightarrow f_0(500)\gamma$, $f_0(500) \rightarrow \pi^0\pi^0$ with a branching ratio $(1.9^{+0.9}_{-0.8} \pm 0.4) \times 10^{-5}$ differing from zero by 2.4 standard deviations. Supersedes ACHASOV 00G.

128 Superseded by ACHASOV 02F.

 Γ_{17}/Γ

NODE=M009R16

NODE=M009R16

 Γ_{10}/Γ

NODE=M009R14

NODE=M009R14

OCCUR=2

NODE=M009R5;LINKAGE=R

NODE=M009R5;LINKAGE=W

NODE=M009R5;LINKAGE=H

NODE=M009R;LINKAGE=KS

NODE=M009R7;LINKAGE=AO

NODE=M009R7;LINKAGE=A

NODE=M009R;LINKAGE=AK

NODE=M009R7;LINKAGE=AZ

NODE=M009R;LINKAGE=BQ

NODE=M009R;LINKAGE=BX

NODE=M009R7;LINKAGE=C

NODE=M009R;LINKAGE=NS

NODE=M009R6;LINKAGE=G

NODE=M009R8;LINKAGE=AC

NODE=M009R12;LINKAGE=J

NODE=M009R12;LINKAGE=I

NODE=M009R12;LINKAGE=N

NODE=M009R9;LINKAGE=AK

NODE=M009R9;LINKAGE=BZ

NODE=M009R9;LINKAGE=AS

NODE=M009R9;LINKAGE=A

NODE=M009R14;LINKAGE=AH

NODE=M009R;LINKAGE=FF

NODE=M009R;LINKAGE=GF

$\rho(770)$ REFERENCES

				NODE=M009
ABRAMOWICZ 12	EPJ C72 1869	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)	REFID=54274
LEES 12G	PR D86 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54299
BENAYOUN 10	EPJ C65 211	M. Benayoun <i>et al.</i>		REFID=53212
ACHASOV 09A	JETP 109 379	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=53101
	Translated from ZETF 136 442.			
ACHASOV 08	JETP 107 61	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=52258
	Translated from ZETF 134 80.			
FUJIKAWA 08	PR D78 072006	M. Fujikawa <i>et al.</i>	(BELLE Collab.)	REFID=52536
ACHASOV 07B	PR D76 077101	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=51942
AKHMETSHIN 07	PL B648 28	R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=51615
ACHASOV 06	JETP 103 380	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=51113
	Translated from ZETF 130 437.			
ACHASOV 06A	PR D74 014016	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=51133
AULCHENKO 06	JETPL 84 413	V.M. Aulchenko <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=51513
	Translated from ZETFP 84 491.			
ACHASOV 05A	JETP 101 1053	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=51045
	Translated from ZETF 128 1201.			
AKHMETSHIN 05	PL B605 26	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=50330
AKHMETSHIN 05A	PL B613 29	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=50508
ALOISIO 05	PL B606 12	A. Aloisio <i>et al.</i>	(KLOE Collab.)	REFID=51112
AULCHENKO 05	JETPL 82 743	V.M. Aulchenko <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=51060
	Translated from ZETFP 82 841.			
SCHAEL 05C	PRPL 421 191	S. Schael <i>et al.</i>	(ALEPH Collab.)	REFID=50845
AKHMETSHIN 04	PL B578 285	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=49609
AKHMETSHIN 04B	PL B580 119	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=49610
ACHASOV 03	PL B559 171	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=49187
ACHASOV 03D	PR D68 052006	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=49577
ALOISIO 03	PL B561 55	A. Aloisio <i>et al.</i>	(KLOE Collab.)	REFID=49404
SANZ-CILLERO 03	EPJ C27 587	J.J. Sanz-Cillero, A. Pich		REFID=49399
ACHASOV 02	PR D65 032002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=48549
ACHASOV 02F	PL B537 201	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=48816
AKHMETSHIN 02	PL B527 161	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=48565
AKHMETSHIN 01B	PL B509 217	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=48167
COLANGELO 01	NP B603 125	G. Colangelo, J. Gasser, H. Leytwyler		REFID=49180
PICH 01	PR D63 093005	A. Pich, J. Portoles		REFID=48313
ACHASOV 00	EPJ C12 25	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47417
ACHASOV 00D	JETPL 72 282	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47882
	Translated from ZETFP 72 411.			
ACHASOV 00G	JETPL 71 355	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47929
	Translated from ZETFP 71 519.			
AKHMETSHIN 00	PL B475 190	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=47421
ANDERSON 00A	PR D61 112002	S. Anderson <i>et al.</i>	(CLEO Collab.)	REFID=47468
ABELE 99E	PL B469 270	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=47414
BENAYOUN 98	EPJ C2 269	M. Benayoun <i>et al.</i>	(IPNP, NOVO, ADLD+)	REFID=45859
BREITWEG 98B	EPJ C2 247	J. Breitweg <i>et al.</i>	(ZEUS Collab.)	REFID=46354
GARDNER 98	PR D57 2716	S. Gardner, H.B. O'Connell		REFID=46366
Also	PR D62 019903 (errat)	S. Gardner, H.B. O'Connell		REFID=47981
ABELE 97	PL B391 191	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=45415
ADAMS 97	ZPHY C74 237	M.R. Adams <i>et al.</i>	(E665 Collab.)	REFID=45533
BARATE 97M	ZPHY C76 15	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=45622
BERTIN 97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45701
BOGOLYUB... 97	PAN 60 46	M.Y. Bogolyubsky <i>et al.</i>	(MOSU, SERP)	REFID=45393
	Translated from YAF 60 53.			
O'CONNELL 97	NP A623 559	H.B. O'Connell <i>et al.</i>	(ADLD)	REFID=45860
BENAYOUN 96	ZPHY C72 221	M. Benayoun <i>et al.</i>	(IPNP, NOVO)	REFID=45753
BERNICAH 94	PR D50 4454	A. Bernica, G. Lopez Castro, J. Pestieau	(LOUV+)	REFID=44097
WEIDENAUER 93	ZPHY C59 387	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)	REFID=43585
AGUILAR-... 91	ZPHY C50 405	M. Aguilar-Benitez <i>et al.</i>	(LEBC-EHS Collab.)	REFID=41637
DOLINSKY 91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)	REFID=41369
KUHN 90	ZPHY C48 445	J.H. Kuhn <i>et al.</i>	(MPIM)	REFID=45862
ANTIPOV 89	ZPHY C42 185	Y.M. Antipov <i>et al.</i>	(SERP, JINR, BGNA+)	REFID=40739
BISELLO 89	PL B220 321	D. Bisello <i>et al.</i>	(DM2 Collab.)	REFID=40740
DOLINSKY 89	ZPHY C42 511	S.I. Dolinsky <i>et al.</i>	(NOVO)	REFID=41003
DUBNICKA 89	JPG 15 1349	S. Dubnicka <i>et al.</i>	(JINR, SLOV)	REFID=44082
GESHKEN... 89	ZPHY C45 351	B.V. Geshkenbein	(ITEP)	REFID=41017
KURDADZE 88	JETPL 47 512	L.M. Kurdadze <i>et al.</i>	(NOVO)	REFID=41121
	Translated from ZETFP 47 432.			
VASSERMAN 88	SJNP 47 1035	I.B. Vasserman <i>et al.</i>	(NOVO)	REFID=41019
	Translated from YAF 47 1635.			
VASSERMAN 88B	SJNP 48 480	I.B. Vasserman <i>et al.</i>	(NOVO)	REFID=41020
	Translated from YAF 48 753.			
AULCHENKO 87C	IYF 87-90 Preprint	V.M. Aulchenko <i>et al.</i>	(NOVO)	REFID=41370
CAPRARO 87	NP B288 659	L. Capraro <i>et al.</i>	(CLER, FRAS, MILA+)	REFID=40003
BRAMON 86	PL B173 97	A. Bramon, J. Casulleras	(BARC)	REFID=22102
HUSTON 86	PR D33 3199	J. Huston <i>et al.</i>	(ROCH, FNAL, MINN)	REFID=20137
KURDADZE 86	JETPL 43 643	L.M. Kurdadze <i>et al.</i>	(NOVO)	REFID=40287
	Translated from ZETFP 43 497.			
BARKOV 85	NP B256 365	L.M. Barkov <i>et al.</i>	(NOVO)	REFID=20134
DRUZHININ 84	PL 144B 136	V.P. Druzhinin <i>et al.</i>	(NOVO)	REFID=20561
CHABAUD 83	NP B223 1	V. Chabaud <i>et al.</i>	(CERN, CRAC, MPIM)	REFID=20131
JENSEN 83	PR D27 26	T. Jensen <i>et al.</i>	(ROCH, FNAL, MINN)	REFID=20132
HEYNN 81	ZPHY C7 169	M.F. Heyn, C.B. Lang	(GRAZ)	REFID=20129
BOHACIK 80	PR D21 1342	J. Bohacik, H. Kuhnelt	(SLOV, WIEN)	REFID=20128
LANG 79	PR D19 956	C.B. Lang, A. Mas-Parareda	(GRAZ)	REFID=20126
BARTALUCCI 78	NC 44A 587	S. Bartalucci <i>et al.</i>	(DESY, FRAS)	REFID=20122
WICKLUND 78	PR D17 1197	A.B. Wicklund <i>et al.</i>	(ANL)	REFID=20124
ANDREWS 77	PRL 38 198	D.E. Andrews <i>et al.</i>	(ROCH)	REFID=20120
DEUTSCH... 76	NP B103 426	M. Deutschmann <i>et al.</i>	(AACH3, BERL, BONN+)	REFID=20119
ENGLER 74	PR D10 2070	A. Engler <i>et al.</i>	(CMU, CASE)	REFID=20110
ESTABROOKS 74	NP B79 301	P.G. Estabrooks, A.D. Martin	(DURH)	REFID=20111
GRAYER 74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM)	REFID=20113
BYERLY 73	PR D7 637	W.L. Byerly <i>et al.</i>	(MICH)	REFID=20104
GLADDING 73	PR D8 3721	G.E. Gladding <i>et al.</i>	(HARV)	REFID=20106

HYAMS	73	NP	B64	134	B.D. Hyams <i>et al.</i>	(CERN, MPIM)	REFID=20107
PROTOPOP...	73	PR	D7	1279	S.D. Protopopescu <i>et al.</i>	(LBL)	REFID=20108
BALLAM	72	PR	D5	545	J. Ballam <i>et al.</i>	(SLAC, LBL, TUFTS)	REFID=20094
BENAKSAS	72	PL	39B	289	D. Benakasas <i>et al.</i>	(ORSAY)	REFID=20096
JACOBS	72	PR	D6	1291	L.D. Jacobs	(SACL)	REFID=20101
RATCLIFF	72	PL	38B	345	B.N. Ratcliff <i>et al.</i>	(SLAC)	REFID=20102
ABRAMS	71	PR	D4	653	G.S. Abrams <i>et al.</i>	(LBL)	REFID=20090
ALVENSLEB...	70	PRL	24	786	H. Alvensleben <i>et al.</i>	(DESY)	REFID=20085
BIGGS	70	PRL	24	1197	P.J. Biggs <i>et al.</i>	(DARE)	REFID=20087
ERBE	69	PR	18B	2060	R. Erbe <i>et al.</i>	(German Bubble Chamber Collab.)	REFID=20074
MALAMUD	69	Argonne Conf.	93		E.I. Malamud, P.E. Schlein	(UCLA)	REFID=20077
REYNOLDS	69	PR	18A	1424	B.G. Reynolds <i>et al.</i>	(FSU)	REFID=20080
ROTHWELL	69	PRL	23	1521	P.L. Rothwell <i>et al.</i>	(NEAS)	REFID=20082
WEHMMANN	69	PR	17B	2095	A.A. Wehmann <i>et al.</i>	(HARV, CASE, SLAC+)	REFID=20084
ARMENISE	68	NC	54A	999	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ+)	REFID=20054
BATON	68	PR	17B	1574	J.P. Baton, G. Laurens	(SACL)	REFID=20056
CHUNG	68	PR	16B	1491	S.U. Chung <i>et al.</i>	(LRL)	REFID=20059
FOSTER	68	NP	B6	107	M. Foster <i>et al.</i>	(CERN, CDEF)	REFID=20061
GOURLARIS	68	PRL	21	244	G.J. Gouaris, J.J. Sakurai	(ORSAY, MILA, UCLA)	REFID=48054
HUSON	68	PL	28B	208	R. Huson <i>et al.</i>	(CERN, MPIM)	REFID=20062
HYAMS	68	NP	B7	1	B.D. Hyams <i>et al.</i>	(HARV)	REFID=20063
LANZEROTTI	68	PR	16B	1365	L.J. Lanzerotti <i>et al.</i>	(CERN)	REFID=20068
PISUT	68	NP	B6	325	J. Pisut, M. Roos	(DESY, COLU)	REFID=20070
ASBURY	67B	PRL	19	865	J.G. Asbury <i>et al.</i>	(BNL)	REFID=20038
BACON	67	PR	15T	1263	T.C. Bacon <i>et al.</i>	(PURD)	REFID=20039
EISNER	67	PR	16A	1699	R.L. Eisner <i>et al.</i>	(COLU)	REFID=20046
HUWE	67	PL	24B	252	D.O. Huwe <i>et al.</i>	(CERN, MPIM)	REFID=20049
HYAMS	67	PL	24B	634	B.D. Hyams <i>et al.</i>	(PURD)	REFID=20050
MILLER	67B	PR	15A	1423	D.H. Miller <i>et al.</i>	(COLU, RUTG)	REFID=20051
ALFF....	66	PR	145	1072	C. Alff-Steinberger <i>et al.</i>	(ROCH)	REFID=10762
FERBEL	66	PL	21	111	T. Ferbel	(PENN, SACL)	REFID=20028
HAGOPIAN	66	PR	145	1128	V. Hagopian <i>et al.</i>	(PENN, LRL)	REFID=20030
HAGOPIAN	66B	PR	152	1183	V. Hagopian, Y.L. Pan	(LRL)	REFID=20031
JACOBS	66B	UCRL	16877	L.D. Jacobs	(YALE, BNL)	REFID=20033	
JAMES	66	PR	142	896	F.E. James, H.L. Kraybill		REFID=10770
ROSS	66	PR	149	1172	M. Ross, L. Stodolsky		REFID=46380
SOEDING	66	PL	B19	702	P. Soeding		REFID=46385
WEST	66	PR	149	1089	E. West <i>et al.</i>	(WISC)	REFID=20035
BLIEDEN	65	PL	19	444	H.R. Blieden <i>et al.</i>	(CERN MMS Collab.)	REFID=20016
CARMONY	64	PRL	12	254	D.D. Carmony <i>et al.</i>	(UCB)	REFID=20578
GOLDHABER	64	PRL	12	336	G. Goldhaber <i>et al.</i>	(LRL, UCB)	REFID=20013
ABOLINS	63	PRL	11	381	M.A. Abolins <i>et al.</i>	(UCSD)	REFID=20006

 $\omega(782)$ $I^G(J^{PC}) = 0^-(1^{--})$ **$\omega(782)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
782.65±0.12 OUR AVERAGE				Error includes scale factor of 1.9. See the ideogram below.
783.20±0.13±0.16	18680	AKHMETSHIN 05	CMD2	0.60–1.38 $e^+ e^- \rightarrow \pi^0 \gamma$
782.68±0.09±0.04	11200	¹ AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
782.79±0.08±0.09	1.2M	² ACHASOV 03D	RVUE	0.44–2.00 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
782.7 ± 0.1 ± 1.5	19500	WURZINGER 95	SPEC	1.33 $p d \rightarrow {}^3\text{He} \omega$
781.96±0.17±0.80	11k	³ AMSLER 94C	CBAR	0.0 $\bar{p} p \rightarrow \omega \eta \pi^0$
782.08±0.36±0.82	3463	⁴ AMSLER 94C	CBAR	0.0 $\bar{p} p \rightarrow \omega \eta \pi^0$
781.96±0.13±0.17	15k	AMSLER 93B	CBAR	0.0 $\bar{p} p \rightarrow \omega \pi^0 \pi^0$
782.4 ± 0.2	270k	WEIDENAUER 93	ASTE	$\bar{p} p \rightarrow 2\pi^+ 2\pi^- \pi^0$
782.2 ± 0.4	1488	KURDADZE 83B	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
782.4 ± 0.5	7000	⁵ KEYNE 76	CNTR	$\pi^- p \rightarrow \omega n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
781.91±0.24		⁶ LEES 12G	BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
781.78±0.10		⁷ BARKOV 87	CMD	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
783.3 ± 0.4	433	CORDIER 80	DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
782.5 ± 0.8	33260	ROOS 80	RVUE	0.0–3.6 $\bar{p} p$
782.6 ± 0.8	3000	BENKHEIRI 79	OMEG	9–12 $\pi^\pm p$
781.8 ± 0.6	1430	COOPER 78B	HBC	0.7–0.8 $\bar{p} p \rightarrow 5\pi$
782.7 ± 0.9	535	VANAPEL...	HBC	7.2 $\bar{p} p \rightarrow \bar{p} p \omega$
783.5 ± 0.8	2100	GESELLER 77	HBC	11 $\pi^- p \rightarrow \omega n$
782.5 ± 0.8	418	AGUILAR-...	HBC	3.9, 4.6 $K^- p$
783.4 ± 1.0	248	BIZZARRI 71	HBC	0.0 $p \bar{p} \rightarrow K^+ K^- \omega$
781.0 ± 0.6	510	BIZZARRI 71	HBC	0.0 $p \bar{p} \rightarrow K_1 K_1 \omega$
783.7 ± 1.0	3583	⁸ COYNE 71	HBC	3.7 $\pi^+ p \rightarrow p \pi^+ \pi^+ \pi^- \pi^0$
784.1 ± 1.2	750	⁹ ABRAMOVIC 70	HBC	3.9 $\pi^- p$
783.2 ± 1.6		BIGGS 70B	CNTR	$<4.1 \gamma C \rightarrow \pi^+ \pi^- C$
782.4 ± 0.5	2400	BIZZARRI 69	HBC	0.0 $\bar{p} p$

NODE=M001

NODE=M001M

NODE=M001M

OCCUR=2

OCCUR=2

OCCUR=2

¹ Update of AKHMETSHIN 00C.

² From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

³ From the $\eta \rightarrow \gamma\gamma$ decay.

⁴ From the $\eta \rightarrow 3\pi^0$ decay.

⁵ Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.

⁶ From the $\rho - \omega$ interference in the $\pi^+\pi^-$ mass spectrum using the Breit-Wigner for the ω and leaving its mass and width as free parameters of the fit.

⁷ Systematic uncertainties underestimated.

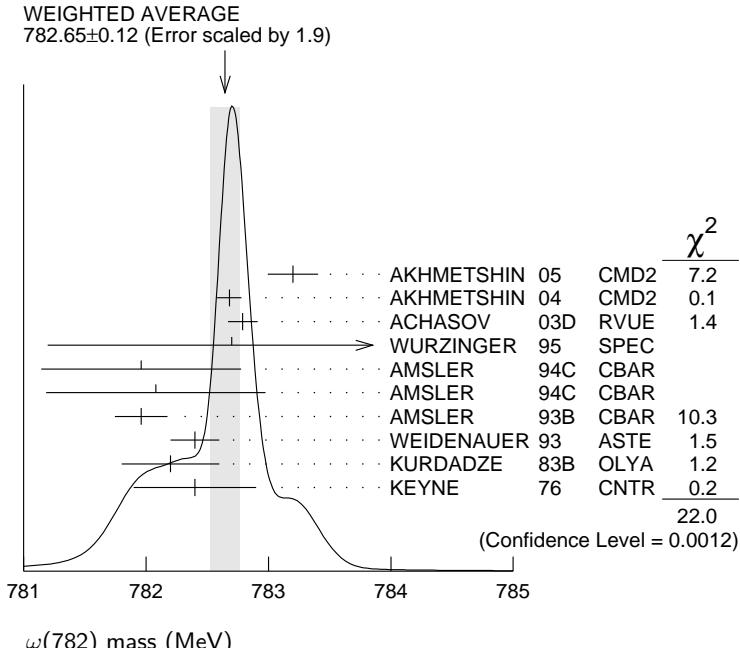
⁸ From best-resolution sample of COYNE 71.

⁹ From $\omega - \rho$ interference in the $\pi^+\pi^-$ mass spectrum assuming ω width 12.6 MeV.

NODE=M001M;LINKAGE=PT
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NODE=M001M;LINKAGE=S1
NODE=M001M;LINKAGE=S2
NODE=M001M;LINKAGE=B
NODE=M001M;LINKAGE=LE

NODE=M001M;LINKAGE=KB
NODE=M001M;LINKAGE=D
NODE=M001M;LINKAGE=F



$\omega(782)$ mass (MeV)

$\omega(782)$ WIDTH

NODE=M001W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
8.49±0.08 OUR AVERAGE				
8.68±0.23±0.10	11200	1 AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.68±0.04±0.15	1.2M	2 ACHASOV 03D	RVUE	$0.44-2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.2 ± 0.3	19500	WURZINGER 95	SPEC	$1.33 pd \rightarrow {}^3He\omega$
8.4 ± 0.1		3 AULCHENKO 87	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.30±0.40		BARKOV 87	CMD	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.8 ± 0.9	1488	KURDADZE 83B	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.0 ± 0.8	433	CORDIER 80	DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.1 ± 0.8	451	BENAKSAS 72B	OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

8.13±0.45		4 LEES	12G BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
12 ± 2	1430	COOPER	78B HBC	$0.7-0.8 \bar{p}p \rightarrow 5\pi$
9.4 ± 2.5	2100	GESSAROLI	77 HBC	$11\pi^- p \rightarrow \omega n$
10.22±0.43	20000	5 KEYNE	76 CNTR	$\pi^- p \rightarrow \omega n$
13.3 ± 2	418	AGUILAR-...	72B HBC	$3.9, 4.6 K^- p$
10.5 ± 1.5		BORENSTEIN	72 HBC	$2.18 K^- p$
7.70±0.9 ± 1.15	940	BROWN	72 MMS	$2.5\pi^- p \rightarrow n MM$
10.3 ± 1.4	510	BIZZARRI	71 HBC	$0.0 p\bar{p} \rightarrow K_1 K_1 \omega$
12.8 ± 3.0	248	BIZZARRI	71 HBC	$0.0 p\bar{p} \rightarrow K^+ K^- \omega$
9.5 ± 1.0	3583	COYNE	71 HBC	$3.7\pi^+ p \rightarrow p\pi^+\pi^-\pi^0$

OCCUR=2

¹ Update of AKHMETSHIN 00c.

²From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega \pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

³ Relativistic Breit-Wigner includes radiative corrections

⁴ From the $\rho - \omega$ interference in the $\pi^+ \pi^-$ mass spectrum using the Breit-Wigner for the ω and leaving its mass and width as free parameters of the fit.

⁵ Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.

NODE=M001W;LINKAGE=PT
NODE=M001W;LINKAGE=VH

NODE=M001W;LINKAGE=D
NODE=M001W;LINKAGE=LE

NODE=M001W;LINKAGE=B

NODE=M001215;NODE=M001

$\omega(782)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
$\Gamma_1 \pi^+ \pi^- \pi^0$	(89.2 \pm 0.7) %		DESIG=1
$\Gamma_2 \pi^0 \gamma$	(8.28 \pm 0.28) %	S=2.1	DESIG=3
$\Gamma_3 \pi^+ \pi^-$	(1.53 \pm 0.11) $\times 10^{-3}$	S=1.2	DESIG=2
Γ_4 neutrals (excluding $\pi^0 \gamma$)	(8 \pm 5) $\times 10^{-3}$	S=1.1	DESIG=13
$\Gamma_5 \eta \gamma$	(4.6 \pm 0.4) $\times 10^{-4}$	S=1.1	DESIG=6
$\Gamma_6 \pi^0 e^+ e^-$	(7.7 \pm 0.6) $\times 10^{-4}$		DESIG=14
$\Gamma_7 \pi^0 \mu^+ \mu^-$	(1.3 \pm 0.4) $\times 10^{-4}$	S=2.1	DESIG=11
$\Gamma_8 \eta e^+ e^-$			DESIG=18
$\Gamma_9 e^+ e^-$	(7.28 \pm 0.14) $\times 10^{-5}$	S=1.3	DESIG=7
$\Gamma_{10} \pi^+ \pi^- \pi^0 \pi^0$	< 2 $\times 10^{-4}$	CL=90%	DESIG=12
$\Gamma_{11} \pi^+ \pi^- \gamma$	< 3.6 $\times 10^{-3}$	CL=95%	DESIG=4
$\Gamma_{12} \pi^+ \pi^- \pi^+ \pi^-$	< 1 $\times 10^{-3}$	CL=90%	DESIG=15
$\Gamma_{13} \pi^0 \pi^0 \gamma$	(6.6 \pm 1.1) $\times 10^{-5}$		DESIG=5
$\Gamma_{14} \eta \pi^0 \gamma$	< 3.3 $\times 10^{-5}$	CL=90%	DESIG=17
$\Gamma_{15} \mu^+ \mu^-$	(9.0 \pm 3.1) $\times 10^{-5}$		DESIG=8
$\Gamma_{16} 3\gamma$	< 1.9 $\times 10^{-4}$	CL=95%	DESIG=10
Charge conjugation (C) violating modes			
$\Gamma_{17} \eta \pi^0$	C < 2.1 $\times 10^{-4}$	CL=90%	NODE=M001;
$\Gamma_{18} 2\pi^0$	C < 2.1 $\times 10^{-4}$	CL=90%	DESIG=9
$\Gamma_{19} 3\pi^0$	C < 2.3 $\times 10^{-4}$	CL=90%	DESIG=193
			DESIG=16

Charge conjugation (C) violating modes

An overall fit to 15 branching ratios uses 51 measurements and one constraint to determine 10 parameters. The overall fit has a $\chi^2 = 51.8$ for 42 degrees of freedom.

The following off-diagonal array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	22								
x_3	-18	-4							
x_4	-92	-56	1						
x_5	7	7	-1	-9					
x_6	-1	0	0	0	0				
x_7	-1	0	0	0	0	0			
x_9	-38	-33	7	44	-21	0	0		
x_{13}	1	4	0	-2	0	0	0	-1	
x_{15}	0	0	0	0	0	0	0	0	0
	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_9	x_{13}

$\omega(782)$ PARTIAL WIDTHS

$\Gamma(\pi^0\gamma)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •					
788±12±27	36500	¹ ACHASOV 03	SND	0.60–0.97 $e^+e^- \rightarrow \pi^0\gamma$	
764±51	10625	DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$	

¹ Using $\Gamma_\omega = 8.44 \pm 0.09$ MeV and $B(\omega \rightarrow \pi^0\gamma)$ from ACHASOV 03.

$\Gamma(\eta\gamma)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.1±2.5		¹ DOLINSKY 89	ND	$e^+e^- \rightarrow \eta\gamma$	

¹ Using $\Gamma_\omega = 8.4 \pm 0.1$ MeV and $B(\omega \rightarrow \eta\gamma)$ from DOLINSKY 89.

$\Gamma(e^+e^-)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_9
0.60 ± 0.02 OUR EVALUATION					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.591±0.015	11200	^{1,2} AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
0.653±0.003±0.021	1.2M	³ ACHASOV 03D	RVUE	$0.44\text{--}2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
0.600±0.031	10625	DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$	

¹ Using $B(\omega \rightarrow \pi^+\pi^-\pi^0) = 0.891 \pm 0.007$ and $\Gamma_{\text{total}} = 8.44 \pm 0.09$ MeV.

² Update of AKHMETSHIN 00C.

³ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$.

$\omega(782) \Gamma(e^+e^-)\Gamma(i)/\Gamma^2(\text{total})$

$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_9/\Gamma \times \Gamma_1/\Gamma$
6.49±0.11 OUR FIT Error includes scale factor of 1.3.					
6.38±0.10 OUR AVERAGE Error includes scale factor of 1.1.					
6.24±0.11±0.08	11.2k	¹ AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
6.70±0.06±0.27		AUBERT,B 04N	BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$	
6.74±0.04±0.24	1.2M	^{2,3} ACHASOV 03D	RVUE	$0.44\text{--}2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
6.37±0.35		² DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
6.45±0.24		² BARKOV 87	CMD	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
5.79±0.42	1488	² KURDADZE 83B	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
5.89±0.54	433	² CORDIER 80	DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
7.54±0.84	451	² BENAKSAS 72B	OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	

• • • We do not use the following data for averages, fits, limits, etc. **• • •**

6.20±0.13 ⁴ BENAYOUN 10 RVUE $0.4\text{--}1.05 e^+e^-$

¹ Update of AKHMETSHIN 00C.

² Recalculated by us from the cross section in the peak.

³ From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

⁴ A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.

$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_9/\Gamma \times \Gamma_2/\Gamma$
6.02±0.20 OUR FIT Error includes scale factor of 1.9.					
6.45±0.17 OUR AVERAGE					
6.47±0.14±0.39	18680	AKHMETSHIN 05	CMD2	$0.60\text{--}1.38 e^+e^- \rightarrow \pi^0\gamma$	
6.50±0.11±0.20	36500	¹ ACHASOV 03	SND	$0.60\text{--}0.97 e^+e^- \rightarrow \pi^0\gamma$	
6.34±0.21±0.21	10625	² DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$	

• • • We do not use the following data for averages, fits, limits, etc. **• • •**

6.80±0.13 ³ BENAYOUN 10 RVUE $0.4\text{--}1.05 e^+e^-$

¹ Using $\sigma_\phi \rightarrow \pi^0\gamma$ from ACHASOV 00 and $m_\omega = 782.57$ MeV in the model with the energy-independent phase of $\rho\omega$ interference equal to $(-10.2 \pm 7.0)^\circ$.

² Recalculated by us from the cross section in the peak.

³ A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.

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$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$					$\Gamma_9/\Gamma \times \Gamma_3/\Gamma$
VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.225±0.058±0.041	800k	1 ACHASOV	06 SND	$e^+e^- \rightarrow \pi^+\pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.146±0.057		2 BENAYOUN	10 RVUE	0.4–1.05 e^+e^-	
1 Supersedes ACHASOV 05A. 2 A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data.					
$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}$					$\Gamma_9/\Gamma \times \Gamma_5/\Gamma$
VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.32±0.28 OUR FIT		Error includes scale factor of 1.1.			
3.18±0.28 OUR AVERAGE					
3.10±0.31±0.11	33k	1 ACHASOV	07B SND	0.6–1.38 $e^+e^- \rightarrow \eta\gamma$	
$3.17^{+1.85}_{-1.31} \pm 0.21$	17.4k	2 AKHMETSHIN 05	CMD2	0.60–1.38 $e^+e^- \rightarrow \eta\gamma$	
3.41±0.52±0.21	23k	3,4 AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.50±0.10		5 BENAYOUN	10 RVUE	0.4–1.05 e^+e^-	
1 From a combined fit of $\sigma(e^+e^- \rightarrow \eta\gamma)$ with $\eta \rightarrow 3\pi^0$ and $\eta \rightarrow \pi^+\pi^-\pi^0$, and fixing $B(\eta \rightarrow 3\pi^0) / B(\eta \rightarrow \pi^+\pi^-\pi^0) = 1.44 \pm 0.04$. Recalculated by us from the cross section at the peak. Supersedes ACHASOV 00D and ACHASOV 06A. 2 From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$. 3 From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$. 4 The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively). 5 A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data.					

$\omega(782)$ BRANCHING RATIOS

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.9024±0.0019		1 AMBROSINO 08G	KLOE	$1.0^{+1.03}_{-1.03} e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$	
$0.8965 \pm 0.0016 \pm 0.0048$	1.2M	2,3 ACHASOV	03D RVUE	$0.44^{+2.00}_{-2.00} e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
$0.880 \pm 0.020 \pm 0.032$	11200	3,4 AKHMETSHIN 00C	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
0.8942±0.0062		3 DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
1 Not independent of $\Gamma(\pi^0\gamma) / \Gamma(\pi^+\pi^-\pi^0)$ from AMBROSINO 08G. 2 Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$. 3 Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}^2$. 4 Using $\Gamma(e^+e^-) = 0.60 \pm 0.02$ keV.					

$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$					Γ_2/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.09±0.14		1 AMBROSINO 08G	KLOE	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$	
$9.06 \pm 0.20 \pm 0.57$	18680	2,3 AKHMETSHIN 05	CMD2	$0.60^{+1.38}_{-1.38} e^+e^- \rightarrow \pi^0\gamma$	
$9.34 \pm 0.15 \pm 0.31$	36500	3 ACHASOV 03	SND	$0.60^{+0.97}_{-0.97} e^+e^- \rightarrow \pi^0\gamma$	
$8.65 \pm 0.16 \pm 0.42$	1.2M	4,5 ACHASOV 03D	RVUE	$0.44^{+2.00}_{-2.00} e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
8.39±0.24	9975	6 BENAYOUN 96	RVUE	$e^+e^- \rightarrow \pi^0\gamma$	
8.88±0.62	10625	3 DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$	
1 Not independent of $\Gamma(\pi^0\gamma) / \Gamma(\pi^+\pi^-\pi^0)$ from AMBROSINO 08G. 2 Using $B(\omega \rightarrow e^+e^-) = (7.14 \pm 0.13) \times 10^{-5}$. 3 Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$. 4 Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$. 5 Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}^2$. 6 Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.					

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$\Gamma(\pi^0\gamma)/\Gamma(\pi^+\pi^-\pi^0)$

<u>VALUE</u> (units 10^{-2})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_2/Γ_1
9.28±0.31 OUR FIT	Error includes scale factor of 2.3.			
9.05±0.27 OUR AVERAGE	Error includes scale factor of 1.8.			
8.97±0.16	AMBROSINO 08G	KLOE	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$	
9.94±0.36±0.38	¹ AULCHENKO 00A	SND	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$	
8.4 ±1.3	KEYNE 76	CNTR	$\pi^- p \rightarrow \omega n$	
10.9 ±2.5	BENAKSAS 72C	OSPK	$e^+e^- \rightarrow \pi^0\gamma$	
8.1 ±2.0	BALDIN 71	HLBC	$2.9\pi^+p$	
13 ±4	JACQUET 69B	HLBC	$2.05\pi^+p \rightarrow \pi^+p\omega$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9.7 ±0.2 ±0.5	^{2,3} ACHASOV 03D	RVUE	$0.44-2.00\pi^+\pi^-\pi^0$	
9.9 ±0.7	² DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$	

¹ From $\sigma_0^{\omega\pi^0 \rightarrow \pi^0\pi^0\gamma}(m_\phi)/\sigma_0^{\omega\pi^0 \rightarrow \pi^+\pi^-\pi^0\pi^0}(m_\phi)$ with a phase-space correction factor of 1/1.023.

² Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$.

³ Using ACHASOV 03. Based on 1.2M events.

 $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_3/Γ

See also $\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$.

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_3/Γ
1.53±0.11 OUR FIT	Error includes scale factor of 1.2.				
1.49±0.13 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.				
1.46±0.12±0.02	900k	¹ AKHMETSHIN 07	$e^+e^- \rightarrow \pi^+\pi^-$		
1.30±0.24±0.05	11.2k	² AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-$	
2.38 ^{+1.77} _{-0.90} ±0.18	5.4k	³ ACHASOV 02E	SND	$1.1-1.38\pi^+\pi^-\pi^0$	
2.3 ±0.5		BARKOV 85	OLYA	$e^+e^- \rightarrow \pi^+\pi^-$	
1.6 ^{+0.9} _{-0.7}		QUENZER 78	DM1	$e^+e^- \rightarrow \pi^+\pi^-$	
3.6 ±1.9		BENAKSAS 72	OSPK	$e^+e^- \rightarrow \pi^+\pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.75±0.11	4.5M	⁴ ACHASOV 05A	SND	$e^+e^- \rightarrow \pi^+\pi^-$	
2.01±0.29		⁵ BENAYOUN 03	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	
1.9 ±0.3		⁶ GARDNER 99	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	
2.3 ±0.4		⁷ BENAYOUN 98	RVUE	$e^+e^- \rightarrow \pi^+\pi^-, \mu^+\mu^-$	
1.0 ±0.11		⁸ WICKLUND 78	ASPK	$3,4,6\pi^\pm N$	
1.22±0.30		ALVENSLEB...	71C	CNTR Photoproduction	
1.3 ^{+1.2} _{-0.9}		MOFFEIT 71	HBC	$2.8,4.7\gamma p$	
0.80 ^{+0.28} _{-0.20}		⁹ BIGGS 70B	CNTR	$4.2\gamma C \rightarrow \pi^+\pi^-C$	

¹ A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.

² Update of AKHMETSHIN 02.

³ From the $m_{\pi^+\pi^-}$ spectrum taking into account the interference of the $\rho\pi$ and $\omega\pi$ amplitudes.

⁴ Using $\Gamma(\omega \rightarrow e^+e^-)$ from the 2004 Edition of this Review (PDG 04).

⁵ Using the data of AKHMETSHIN 02 in the hidden local symmetry model.

⁶ Using the data of BARKOV 85.

⁷ Using the data of BARKOV 85 in the hidden local symmetry model.

⁸ From a model-dependent analysis assuming complete coherence.

⁹ Re-evaluated under $\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$ by BEHREND 71 using more accurate $\omega \rightarrow \rho$ photoproduction cross-section ratio.

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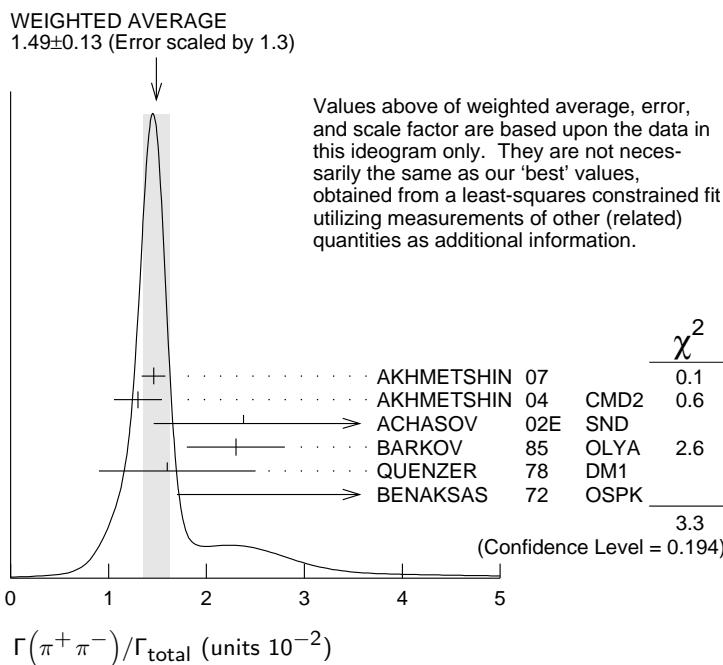
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$\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$

See also $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0172±0.0014 OUR FIT		Error includes scale factor of 1.2.		
0.026 ±0.005 OUR AVERAGE				
0.021 +0.028 -0.009	1,2 RATCLIFF	72 ASPK	15 $\pi^- p \rightarrow n 2\pi$	
0.028 ±0.006	1 BEHREND	71 ASPK	Photoproduction	
0.022 +0.009 -0.011	3 ROOS	70 RVUE		

¹ The fitted width of these data is 160 MeV in agreement with present average, thus the ω contribution is overestimated. Assuming ρ width 145 MeV.

² Significant interference effect observed. NB of $\omega \rightarrow 3\pi$ comes from an extrapolation.

³ ROOS 70 combines ABRAMOVICH 70 and BIZZARRI 70.

$\Gamma(\pi^+\pi^-)/\Gamma(\pi^0\gamma)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.20±0.04	1.98M	¹ ALOISIO	03 KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

¹ Using the data of ALOISIO 02D.

$\Gamma(\text{ neutrals})/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.091±0.006 OUR FIT				
0.081±0.011 OUR AVERAGE				
0.075±0.025	BIZZARRI	71 HBC	0.0 $p\bar{p}$	
0.079±0.019	DEINET	69B OSPK	1.5 $\pi^- p$	
0.084±0.015	BOLLINI	68C CNTR	2.1 $\pi^- p$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.073±0.018	42 BASILE	72B CNTR	1.67 $\pi^- p$	

$(\Gamma_2+\Gamma_4)/\Gamma_1$

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NODE=M001R14

$\Gamma(\text{ neutrals})/\Gamma(\pi^+\pi^-\pi^0)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.102±0.008 OUR FIT				

$(\Gamma_2+\Gamma_4)/\Gamma_1$

NODE=M001R1

NODE=M001R1

0.103^{+0.011}_{-0.010} OUR AVERAGE

0.15 ±0.04	46 AGUILAR...	72B HBC	3.9,4.6 $K^- p$
0.10 ±0.03	19 BARASH	67B HBC	0.0 $\bar{p}p$
0.134±0.026	850 DIGUGNO	66B CNTR	1.4 $\pi^- p$
0.097±0.016	348 FLATTE	66 HBC	1.4 – 1.7 $K^- p \rightarrow \Lambda M$
0.06 +0.05 -0.02	JAMES	66 HBC	2.1 $\pi^+ p$
0.08 ±0.03	35 KRAEMER	64 DBC	1.2 $\pi^+ d$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.11 ±0.02	20 BUSCHBECK	63 HBC	1.5 $K^- p$

$\Gamma(\pi^0\gamma)/\Gamma(\text{ neutrals})$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.78±0.07		¹ DAKIN	72	OSPK 1.4 $\pi^- p \rightarrow n\text{MM}$
>0.81	90	DEINET	69B	OSPK

¹ Error statistical only. Authors obtain good fit also assuming $\pi^0\gamma$ as the only neutral decay.

 $\Gamma(\text{ neutrals})/\Gamma(\text{ charged particles})$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.100±0.008 OUR FIT			
0.124±0.021	FELDMAN	67C	OSPK 1.2 $\pi^- p$

 $\Gamma(\eta\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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4.6 ±0.4 OUR FIT Error includes scale factor of 1.1.

6.3 ±1.3 OUR AVERAGE Error includes scale factor of 1.2.

6.6 ±1.7		¹ ABELE	97E	CBAR 0.0 $\bar{p}p \rightarrow 5\gamma$
8.3 ±2.1		ALDE	93	GAM2 38 $\pi^- p \rightarrow \omega n$
3.0 ±2.5 -1.8		² ANDREWS	77	CNTR 6.7–10 γCu

• • • We do not use the following data for averages, fits, limits, etc. • • •

4.3 ±0.5 ±0.1	33k	³ ACHASOV	07B	SND 0.6–1.38 $e^+e^- \rightarrow \eta\gamma$
4.44 ±2.59 -1.83 ±0.28	17.4k	^{4,5} AKHMETSHIN	05	CMD2 0.60–1.38 $e^+e^- \rightarrow \eta\gamma$
5.10 ±0.72 ±0.34	23k	⁶ AKHMETSHIN	01B	CMD2 $e^+e^- \rightarrow \eta\gamma$
0.7 to 5.5		⁷ CASE	00	CBAR 0.0 $p\bar{p} \rightarrow \eta\eta\gamma$
6.56 ±2.41 -2.55	3525	^{2,8} BENAYOUN	96	RVUE $e^+e^- \rightarrow \eta\gamma$
7.3 ±2.9		^{2,4} DOLINSKY	89	ND $e^+e^- \rightarrow \eta\gamma$

¹ No flat $\eta\eta\gamma$ background assumed.

² Solution corresponding to constructive $\omega\text{-}\rho$ interference.

³ ACHASOV 07B reports $[\Gamma(\omega(782) \rightarrow \eta\gamma)/\Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow e^+e^-)] = (3.10 \pm 0.31 \pm 0.11) \times 10^{-8}$ which we divide by our best value $B(\omega(782) \rightarrow e^+e^-) = (7.28 \pm 0.14) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Supersedes ACHASOV 00D and ACHASOV 06A.

⁴ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.

⁵ Using $B(\omega \rightarrow e^+e^-) = (7.14 \pm 0.13) \times 10^{-5}$ and $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.

⁶ Using $B(\omega \rightarrow e^+e^-) = (7.07 \pm 0.19) \times 10^{-5}$ and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$. Solution corresponding to constructive $\omega\text{-}\rho$ interference. The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively). Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.

⁷ Depending on the degree of coherence with the flat $\eta\eta\gamma$ background and using $B(\omega \rightarrow \pi^0\gamma) = (8.5 \pm 0.5) \times 10^{-2}$.

⁸ Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.

 $\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			

0.0098±0.0024		¹ ALDE	93	GAM2 38 $\pi^- p \rightarrow \omega n$
0.0082±0.0033		² DOLINSKY	89	ND $e^+e^- \rightarrow \eta\gamma$
0.010 ±0.045		APEL	72B	OSPK 4–8 $\pi^- p \rightarrow n3\gamma$

¹ Model independent determination.

² Solution corresponding to constructive $\omega\text{-}\rho$ interference.

 $\Gamma(\pi^0e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7.7 ±0.6 OUR FIT				
7.7 ±0.6 OUR AVERAGE				

7.61±0.53±0.64		ACHASOV	08	SND 0.36–0.97 $e^+e^- \rightarrow \pi^0e^+e^-$
8.19±0.71±0.62		AKHMETSHIN	05A	CMD2 0.72–0.84 e^+e^-
5.9 ±1.9	43	DOLINSKY	88	ND $e^+e^- \rightarrow \pi^0e^+e^-$

 $\Gamma_2/(\Gamma_2+\Gamma_4)$

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 $(\Gamma_2+\Gamma_4)/(\Gamma_1+\Gamma_3)$

NODE=M001R9
NODE=M001R9

 Γ_5/Γ

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$\Gamma(\pi^0\mu^+\mu^-)/\Gamma_{\text{total}}$					Γ_7/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.3 ± 0.4 OUR FIT		Error includes scale factor of 2.1.			
1.3 ± 0.4 OUR AVERAGE		Error includes scale factor of 2.1.			

1.72 ± 0.25 ± 0.14	3k	ARNALDI 09	NA60 158A	In-In collisions
0.96 ± 0.23		DZHELYADIN 81B	CNTR	25–33 $\pi^- p \rightarrow \omega n$

$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$					Γ_8/Γ
<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.1	AKHMETSHIN 05A	CMD2	0.72–0.84	$e^+ e^-$	

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$					Γ_9/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.728 ± 0.014 OUR FIT		Error includes scale factor of 1.3.			
• • • We do not use the following data for averages, fits, limits, etc. • • •					

0.700 ± 0.016	11200	1,2 AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.752 ± 0.004 ± 0.024	1.2M	2,3 ACHASOV 03D	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.714 ± 0.036		2 DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.72 ± 0.03		2 BARKOV 87	CMD	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.64 ± 0.04	1488	2 KURDADZE 83B	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.675 ± 0.069	433	2 CORDIER 80	DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.83 ± 0.10	451	2 BENAKSAS 72B	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.77 ± 0.06		4 AUGUSTIN 69D	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.65 ± 0.13	33	5 ASTVACAT...	68 OSPK	Assume SU(3)+mixing

1 Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = 0.891 \pm 0.007$. Update of AKHMETSHIN 00C.

2 Not independent of the corresponding $\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$.

3 Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+ \pi^-) = (1.70 \pm 0.28)\%$.

4 Rescaled by us to correspond to ω width 8.4 MeV. Systematic errors underestimated.

5 Not resolved from ρ decay. Error statistical only.

$\Gamma(\pi^+ \pi^- \pi^0 \pi^0)/\Gamma_{\text{total}}$					Γ_{10}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 2	90	ACHASOV 09A	SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<200	90	KURDADZE 86	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$
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$\Gamma(\pi^+ \pi^- \gamma)/\Gamma_{\text{total}}$					Γ_{11}/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.0036	95	WEIDENAUER 90	ASTE	$p\bar{p} \rightarrow \pi^+ \pi^- \pi^+ \pi^- \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.004	95	BITYUKOV 88B	SPEC	$32 \pi^- p \rightarrow \pi^+ \pi^- \gamma X$
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$\Gamma(\pi^+ \pi^- \gamma)/\Gamma(\pi^+ \pi^- \pi^0)$					Γ_{11}/Γ_1
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					

<0.066	90	KALBFLEISCH 75	HBC	$2.18 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$
<0.05	90	FLATTE 66	HBC	$1.2 - 1.7 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$

$\Gamma(\pi^+ \pi^- \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{12}/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1 × 10 ⁻³	90	KURDADZE 88	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^-$	

$\Gamma(\pi^0 \pi^0 \gamma)/\Gamma_{\text{total}}$					Γ_{13}/Γ
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
6.6 ± 1.1 OUR FIT					
6.5 ± 1.2 OUR AVERAGE					

6.4 ^{+2.4} _{-2.0} ± 0.8	190	1 AKHMETSHIN 04B	CMD2	$0.6 - 0.97 e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
6.6 ^{+1.4} _{-1.3} ± 0.6	295	ACHASOV 02F	SND	$0.36 - 0.97 e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$

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NODE=M001R4

NODE=M001R24
NODE=M001R24

NODE=M001R29
NODE=M001R29

• • • We do not use the following data for averages, fits, limits, etc. • • •

$11.8^{+2.1}_{-1.9} \pm 1.4$	190	² AKHMETSHIN 04B	CMD2	$0.6\text{--}0.97 e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	OCCUR=2
$7.8 \pm 2.7 \pm 2.0$	63	^{1,3} ACHASOV 00G	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	OCCUR=2
$12.7 \pm 2.3 \pm 2.5$	63	^{2,3} ACHASOV 00G	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	

1 In the model assuming the $\rho \rightarrow \pi^0 \pi^0 \gamma$ decay via the $\omega \pi$ and $f_0(500) \gamma$ mechanisms.

2 In the model assuming the $\rho \rightarrow \pi^0 \pi^0 \gamma$ decay via the $\omega \pi$ mechanism only.

3 Superseded by ACHASOV 02F.

$\Gamma(\pi^0 \pi^0 \gamma)/\Gamma(\pi^+ \pi^- \pi^0)$			Γ_{13}/Γ_1		
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.00045	90	DOLINSKY	89	ND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.08	95	JACQUET	69B	HLBC	$2.05 \pi^+ p \rightarrow \pi^+ p \omega$
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$\Gamma(\pi^0 \pi^0 \gamma)/\Gamma(\pi^0 \gamma)$			Γ_{13}/Γ_2		
VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
8.0 ± 1.3 OUR FIT					
8.5 ± 2.9	40 ± 14		ALDE	94B GAM2	$38\pi^- p \rightarrow \pi^0 \pi^0 \gamma n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 50	90	DOLINSKY	89	ND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
<1800	95	KEYNE	76	CNTR	$\pi^- p \rightarrow \omega n$
<1500	90	BENAKSAS	72C	OSPK	$e^+ e^-$
<1400		BALDIN	71	HLBC	$2.9 \pi^+ p$
<1000	90	BARMIN	64	HLBC	$1.3\text{--}2.8 \pi^- p$

$\Gamma(\pi^0 \pi^0 \gamma)/\Gamma(\text{ neutrals})$			$\Gamma_{13}/(\Gamma_2 + \Gamma_4)$		
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.22 ± 0.07		¹ DAKIN	72	OSPK	$1.4 \pi^- p \rightarrow n \text{MM}$
<0.19	90	DEINET	69B	OSPK	

¹ See $\Gamma(\pi^0 \gamma)/\Gamma(\text{ neutrals})$.

$\Gamma(\eta \pi^0 \gamma)/\Gamma_{\text{total}}$			Γ_{14}/Γ		
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<3.3	90	AKHMETSHIN 04B	CMD2	$0.6\text{--}0.97 e^+ e^- \rightarrow \eta \pi^0 \gamma$	NODE=M001R32 NODE=M001R32

$\Gamma(\mu^+ \mu^-)/\Gamma_{\text{total}}$			Γ_{15}/Γ		
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
9.0 ± 3.1 OUR FIT					NODE=M001R30 NODE=M001R30
$9.0 \pm 2.9 \pm 1.1$	18	HEISTER	02C ALEP	$Z \rightarrow \mu^+ \mu^- + X$	

$\Gamma(\mu^+ \mu^-)/\Gamma(\pi^+ \pi^- \pi^0)$			Γ_{15}/Γ_1		
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.2	90	WILSON	69	OSPK	$12 \pi^- C \rightarrow Fe$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.7	74	FLATTE	66	HBC	$1.2\text{--}1.7 K^- p \rightarrow \Lambda \mu^+ \mu^-$
<1.2		BARBARO...	65	HBC	$2.7 K^- p$

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma(\mu^+ \mu^-)$			Γ_7/Γ_{15}		
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					NODE=M001R20 NODE=M001R20
1.2 ± 0.6	30	¹ DZHELYADIN 79	CNTR	$25\text{--}33 \pi^- p$	

¹ Superseded by DZHELYADIN 81B result above.

$\Gamma(3\gamma)/\Gamma_{\text{total}}$			Γ_{16}/Γ		
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.9	95	¹ ABELE 97E	CBAR	$0.0 \bar{p} p \rightarrow 5\gamma$	NODE=M001R27 NODE=M001R27

• • • We do not use the following data for averages, fits, limits, etc. • • •

<2	90	¹ PROKOSHIN 95	GAM2	$38 \pi^- p \rightarrow 3\gamma n$	
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¹ From direct 3γ decay search.

$\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$

Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.001	90	ALDE	94B GAM2	$38\pi^- p \rightarrow \eta\pi^0 n$

 $[\Gamma(\eta\gamma) + \Gamma(\eta\pi^0)]/\Gamma(\pi^+\pi^-\pi^0)$ $(\Gamma_5 + \Gamma_{17})/\Gamma_1$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.016	90	1 FLATTE	66 HBC	$1.2 - 1.7 K^- p \rightarrow \Lambda\pi^+\pi^- MM$

 $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$

<0.045	95	JACQUET	69B HLBC	$2.05\pi^+ p \rightarrow \pi^+ p\omega$
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1 Restated by us using $B(\eta \rightarrow \text{charged modes}) = 29.2\%$. $\Gamma(\eta\pi^0)/\Gamma(\pi^0\gamma)$ Γ_{17}/Γ_2

Violates C conservation.

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.6	90	1 STAROSTIN	09 CRYM	$\gamma p \rightarrow \eta\pi^0 p$

1 STAROSTIN 09 reports $[\Gamma(\omega(782) \rightarrow \eta\pi^0)/\Gamma(\omega(782) \rightarrow \pi^0\gamma)] \times [B(\eta \rightarrow 2\gamma)] < 1.01 \times 10^{-3}$ which we divide by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$. $\Gamma(2\pi^0)/\Gamma(\pi^0\gamma)$ Γ_{18}/Γ_2

Violates C conservation and Bose-Einstein statistics.

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.59	90	STAROSTIN	09 CRYM	$\gamma p \rightarrow 2\pi^0 p$

 $\Gamma(3\pi^0)/\Gamma_{\text{total}}$ Γ_{19}/Γ

Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
< 3×10^{-4}	90	PROKOSHKIN	95 GAM2	$38\pi^- p \rightarrow 3\pi^0 n$

 $\Gamma(3\pi^0)/\Gamma(\pi^0\gamma)$ Γ_{19}/Γ_2

Violates C conservation.

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.72	90	STAROSTIN	09 CRYM	$\gamma p \rightarrow 3\pi^0 p$

 $\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{19}/Γ_1

Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.009	90	BARBERIS	01 450 pp	$\rightarrow p_f 3\pi^0 p_s$

PARAMETER Λ IN $\omega \rightarrow \pi^0\mu^+\mu^-$ DECAYIn the pole approximation the electromagnetic transition form factor for a resonance of mass M is given by the expression:

$$|F|^2 = (1 - M^2/\Lambda^2)^{-2},$$

where for the parameter Λ vector dominance predicts $\Lambda = M_p \approx 0.770$ GeV. The ARNALDI 09 measurement is in obvious conflict with this expectation. Note that for $\eta \rightarrow \mu^+\mu^-\gamma$ decay ARNALDI 09 and DZHELYADIN 80 obtain the value of Λ consistent with vector dominance.

VALUE (GeV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.668 ± 0.009 ± 0.003	3k	ARNALDI	09 NA60	158A In-In collisions

 $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$

0.65 ± 0.03	DZHELYADIN	81B CNTR	25–33 $\pi^- p \rightarrow \omega n$
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NODE=M001R25

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NODE=M001LAM

NODE=M001LAM

w(782) REFERENCES

					NODE=M001
LEES	12G	PR D86 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54299
NIECKNIG	12	EPJ C72 2014	F. Niecknig, B. Kubis, S.P. Schneider	(BONN)	REFID=54305
BENAYOUN	10	EPJ C65 211	M. Benayoun <i>et al.</i>		REFID=53212
ACHASOV	09A	JETP 109 379	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=53101
		Translated from ZETF 136 442.			
ARNALDI	09	PL B677 260	R. Arnaldi <i>et al.</i>	(NA60 Collab.)	REFID=52720
STAROSTIN	09	PR C79 065201	A. Starostin <i>et al.</i>	(Crystal Ball Collab. at MAMI)	REFID=53001
ACHASOV	08	JETP 107 61	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=52258
		Translated from ZETF 134 80.			
AMBROSINO	08G	PL B669 223	F. Ambrosino <i>et al.</i>	(KLOE Collab.)	REFID=52573
ACHASOV	07B	PR D76 077101	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=51942
AKHMETSHIN	07	PL B648 28	R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=51615
ACHASOV	06	JETP 103 380	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=51113
		Translated from ZETF 130 437.			
ACHASOV	06A	PR D74 014016	M.N. Achasov <i>et al.</i>	(SND Collab.)	REFID=51133
AULCHENKO	06	JETPL 84 413	V.M. Aulchenko <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=51513
ACHASOV	05A	JETP 101 1053	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=51045
		Translated from ZETF 128 1201.			
AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=50330
AKHMETSHIN	05A	PL B613 29	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=50508
AULCHENKO	05	JETPL 82 743	V.M. Aulchenko <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=51060
		Translated from ZETFP 82 841.			
AKHMETSHIN	04	PL B578 285	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=49609
AKHMETSHIN	04B	PL B580 119	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=49610
AUBERT,B	04N	PR D70 072004	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50184
PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)	REFID=49653
ACHASOV	03	PL B559 171	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=49187
ACHASOV	03D	PR D68 052006	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=49577
ALOISIO	03	PL B561 55	A. Aloisio <i>et al.</i>	(KLOE Collab.)	REFID=49404
BENAYOUN	03	EPJ C29 397	M. Benayoun <i>et al.</i>		REFID=49477
ACHASOV	02E	PR D66 032001	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=48815
ACHASOV	02F	PL B537 201	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=48816
AKHMETSHIN	02	PL B527 161	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=48565
ALOISIO	02D	PL B527 21	A. Aloisio <i>et al.</i>	(KLOE Collab.)	REFID=48824
HEISTER	02C	PL B528 19	A. Heister <i>et al.</i>	(ALEPH Collab.)	REFID=48564
ACHASOV	01E	PR D63 072002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=48311
AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=48167
BARBERIS	01	PL B507 14	D. Barberis <i>et al.</i>		REFID=48324
ACHASOV	00	EPJ C12 25	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47417
ACHASOV	00D	JETPL 72 282	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47882
		Translated from ZETFP 72 411.			
ACHASOV	00G	JETPL 71 355	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47929
		Translated from ZETFP 71 519.			
AKHMETSHIN	00C	PL B476 33	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=47423
AULCHENKO	00A	JETP 90 927	V.M. Aulchenko <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47953
		Translated from ZETFP 117 1067.			
CASE	00	PR D61 032002	T. Case <i>et al.</i>	(Crystal Barrel Collab.)	REFID=47409
ACHASOV	99E	PL B462 365	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47391
GARDNER	99	PR D59 076002	S. Gardner, H.B. O'Connell		REFID=46919
BENAYOUN	98	EPJ C2 269	M. Benayoun <i>et al.</i>	(IPNP, NOVO, ADLD+)	REFID=45859
ABELE	97E	PL B411 361	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=45755
BENAYOUN	96	ZPHY C72 221	M. Benayoun <i>et al.</i>	(IPNP, NOVO)	REFID=45753
PROKOSHKIN	95	SPD 40 273	Y.D. Prokoshkin, V.D. Samoilenko	(SERP)	REFID=44616
		Translated from DANS 342 610.			
WURZINGER	95	PR C51 443	R. Würzinger <i>et al.</i>	(BONN, ORSAY, SACL+)	REFID=45209
ALDE	94B	PL B340 122	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)	REFID=44100
AMSLER	94C	PL B327 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44091
ALDE	93	PAN 56 1229	D.M. Alde <i>et al.</i>	(SERP, LAPP, LANL, BELG+)	REFID=43603
		Translated from YAF 56 137.			
Also		ZPHY C61 35	D.M. Alde <i>et al.</i>	(SERP, LAPP, LANL, BELG+)	REFID=43790
AMSLER	93B	PL B311 362	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43602
WEIDENAUER	93	ZPHY C59 387	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)	REFID=43585
ANTONELLI	92	ZPHY C56 15	A. Antonelli <i>et al.</i>	(DM2 Collab.)	REFID=43168
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)	REFID=41369
WEIDENAUER	90	ZPHY C47 353	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)	REFID=41368
DOLINSKY	89	ZPHY C42 511	S.I. Dolinsky <i>et al.</i>	(NOVO)	REFID=41003
BITYUKOV	88B	SJNP 47 800	S.I. Bityukov <i>et al.</i>	(SERP)	REFID=41021
		Translated from YAF 47 1258.			
DOLINSKY	88	SJNP 48 277	S.I. Dolinsky <i>et al.</i>	(NOVO)	REFID=41022
		Translated from YAF 48 442.			
KURDADZE	88	JETPL 47 512	L.M. Kurdadze <i>et al.</i>	(NOVO)	REFID=41121
		Translated from ZETFP 47 432.			
AULCHENKO	87	PL B186 432	V.M. Aulchenko <i>et al.</i>	(NOVO)	REFID=40007
BARKOV	87	JETPL 46 164	L.M. Barkov <i>et al.</i>	(NOVO)	REFID=40280
KURDADZE	86	JETPL 43 643	L.M. Kurdadze <i>et al.</i>	(NOVO)	REFID=40287
		Translated from ZETFP 43 497.			
BARKOV	85	NP B256 365	L.M. Barkov <i>et al.</i>	(NOVO)	REFID=20134
DRUZHININ	84	PL 144B 136	V.P. Druzhinin <i>et al.</i>	(NOVO)	REFID=20561
KURDADZE	83B	JETPL 36 274	A.M. Kurdadze <i>et al.</i>	(NOVO)	REFID=20244
		Translated from ZETFP 36 221.			
DZHELYADIN	81B	PL 102B 296	R.I. Dzhelyadin <i>et al.</i>	(SERP)	REFID=20242
CORDIER	80	NP B172 13	A. Cordier <i>et al.</i>	(LALO)	REFID=20240
DZHELYADIN	80	PL 94B 548	R.I. Dzhelyadin <i>et al.</i>	(SERP)	REFID=10831
ROOS	80	LNC 27 321	M. Roos, A. Pellinen	(HELS)	REFID=20241
BENKHEIRI	79	NP B150 268	P. Benkhiri <i>et al.</i>	(EPOL, CERN, CDEF+)	REFID=20238
DZHELYADIN	79	PL 84B 143	R.I. Dzhelyadin <i>et al.</i>	(SERP)	REFID=20239
COOPER	78B	NP B146 1	A.M. Cooper <i>et al.</i>	(TATA, CERN, CDEF+)	REFID=20235
QUENZER	78	PL 76B 512	A. Quenzer <i>et al.</i>	(LALO)	REFID=20123
VANAPEL...	78	NP B133 245	G.W. van Apeldoorn <i>et al.</i>	(ZEEM)	REFID=20234
WICKLUND	78	PR D17 1197	A.B. Wicklund <i>et al.</i>	(ANL)	REFID=20124
ANDREWS	77	PRL 38 198	D.E. Andrews <i>et al.</i>	(ROCH)	REFID=20120
GESAROLI	77	NP B126 382	R. Gessaroli <i>et al.</i>	(BGNA, FIRZ, GENO+)	REFID=20230
KEYNE	76	PR D14 28	J. Keyne <i>et al.</i>	(LOIC, SHMP)	REFID=20226
		Also PR D8 2789	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)	REFID=20216
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)	REFID=20223
AGUILAR...	72B	PR D6 29	M. Aguilar-Benitez <i>et al.</i>	(BNL)	REFID=20205
APEL	72B	PL 41B 234	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA)	REFID=20206
BASILE	72B	Phil. Conf. 153	M. Basile <i>et al.</i>	(CERN)	REFID=20207
BENAKSAS	72	PL 39B 289	D. Benakas <i>et al.</i>	(ORSAY)	REFID=20096
BENAKSAS	72B	PL 42B 507	D. Benakas <i>et al.</i>	(ORSAY)	REFID=20209
BENAKSAS	72C	PL 42B 511	D. Benakas <i>et al.</i>	(ORSAY)	REFID=20517
BORENSTEIN	72	PR D5 1559	S.R. Borenstein <i>et al.</i>	(BNL, MICH)	REFID=20215
BROWN	72	PL 42B 117	R.M. Brown <i>et al.</i>	(ILL, ILLC)	REFID=20211
DAKIN	72	PR D6 2321	J.T. Dakin <i>et al.</i>	(PRIN)	REFID=20212
RATCLIFF	72	PL 38B 345	B.N. Ratcliff <i>et al.</i>	(SLAC)	REFID=20102
ALVENSLEB...	71C	PRU 27 888	H. Alvensleben <i>et al.</i>	(DESY)	REFID=20193
BALDIN	71	SJNP 13 758	A.B. Baldin <i>et al.</i>	(ITEP)	REFID=20195
		Translated from YAF 13 1318.			

BEHREND	71	PRL 27 61	H.J. Behrend <i>et al.</i>	(ROCH, CORN, FNAL)	REFID=20197
BIZZARRI	71	NP B27 140	R. Bizzarri <i>et al.</i>	(CERN, CDEF)	REFID=20198
COYNE	71	NP B32 333	D.G. Coyne <i>et al.</i>	(LRL)	REFID=20201
MOFFEIT	71	NP B29 349	K.C. Moffeit <i>et al.</i>	(LRL, UCB, SLAC+)	REFID=20204
ABRAMOVI...	70	NP B20 209	M. Abramovich <i>et al.</i>	(CERN)	REFID=20180
BIGGS	70B	PRL 24 1201	P.J. Biggs <i>et al.</i>	(DARE)	REFID=20184
BIZZARRI	70	PRL 25 1385	R. Bizzarri <i>et al.</i>	(ROMA, SYRA)	REFID=20181
ROOS	70	DNPL/R7 173	M. Roos	(CERN)	REFID=20191
Proc. Daresbury Study Weekend No. 1.					
AUGUSTIN	69D	PL 28B 513	J.E. Augustin <i>et al.</i>	(ORSAY)	REFID=20169
BIZZARRI	69	NP B14 169	R. Bizzarri <i>et al.</i>	(CERN, CDEF)	REFID=20171
DEINET	69B	PL 30B 426	W. Deinet <i>et al.</i>	(KARL, CERN)	REFID=20173
JACQUET	69B	NC 63A 743	F. Jacquet <i>et al.</i>	(EPOL, BERG)	REFID=20176
WILSON	69	Private Comm.	R. Wilson	(HARV)	REFID=20179
Also		PR 178 2095	A.A. Wehmann <i>et al.</i>	(HARV, CASE, SLAC+)	REFID=20084
ASTVACAT...	68	PL 27B 45	R.G. Astvatsaturov <i>et al.</i>	(JINR, MOSU)	REFID=20055
BOLLINI	68C	NC 56A 531	D. Bollini <i>et al.</i>	(CERN, BGNA, STRB)	REFID=20164
BARASH	67B	PR 156 1399	N. Barash <i>et al.</i>	(COLU)	REFID=20160
FELDMAN	67C	PR 159 1219	M. Feldman <i>et al.</i>	(PENN)	REFID=20161
DIGIUGNO	66B	NC 44A 1272	G. Di Giugno <i>et al.</i>	(NAPL, FRAS, TRST)	REFID=20156
FLATTE	66	PR 145 1050	S.M. Flatte <i>et al.</i>	(LRL)	REFID=20157
JAMES	66	PR 142 896	F.E. James, H.L. Kraybill	(YALE, BNL)	REFID=10770
BARBARO...	65	PRL 14 279	A. Barbaro-Galtieri, R.D. Tripp	(LRL)	REFID=20152
BARMIN	64	JETP 18 1289	V.V. Barmin <i>et al.</i>	(ITEP)	REFID=20149
		Translated from ZETF 45 1879.			
KRAEMER	64	PR 136 B496	R.W. Kraemer <i>et al.</i>	(JHU, NWES, WOOD)	REFID=10755
BUSCHBECK	63	Siena Conf. 1 166	B. Buschbeck <i>et al.</i>	(VIEN, CERN, ANIK)	REFID=20146

 $\eta'(958)$

$I^G(J^{PC}) = 0^+(0^-+)$

$\eta'(958)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
957.78 ± 0.06 OUR AVERAGE				
957.793 ± 0.054 ± 0.036	3.9k	LIBBY	08	CLEO $J/\psi \rightarrow \gamma\eta'$
957.9 ± 0.2 ± 0.6	4800	WURZINGER	96	SPEC $1.68 pd \rightarrow {}^3He\eta'$
957.46 ± 0.33		DUANE	74	MMS $\pi^- p \rightarrow nMM$
958.2 ± 0.5	1414	DANBURG	73	HBC $2.2 K^- p \rightarrow \Lambda\eta'$
958 ± 1	400	JACOBS	73	HBC $2.9 K^- p \rightarrow \Lambda\eta'$
956.1 ± 1.1	3415	¹ BASILE	71	CNTR $1.6 \pi^- p \rightarrow n\eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
957.5 ± 0.2		BAI	04J	BES2 $J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
959 ± 1	630	² BELADIDZE	92C	VES $36 \pi^- Be \rightarrow \pi^-\eta'\eta Be$
958 ± 1	340	² ARMSTRONG	91B	OMEG $300 pp \rightarrow pp\eta\pi^+\pi^-$
958.2 ± 0.4	622	² AUGUSTIN	90	DM2 $J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
957.8 ± 0.2	2420	² AUGUSTIN	90	DM2 $J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
956.3 ± 1.0	143	² GIDAL	87	MRK2 $e^+ e^- \rightarrow e^+ e^- \eta\pi^+\pi^-$
957.4 ± 1.4	535	³ BASILE	71	CNTR $1.6 \pi^- p \rightarrow n\eta'$
957 ± 1		RITTENBERG	69	HBC $1.7-2.7 K^- p$

¹ Using all η' decays.² Systematic uncertainty not estimated.³ Using η' decays into neutrals. Not independent of the other listed BASILE 71 η' mass measurement.

NODE=M002

NODE=M002M

NODE=M002M

OCCUR=2

OCCUR=2

NODE=M002M;LINKAGE=BS

NODE=M002M;LINKAGE=NS

NODE=M002M;LINKAGE=BA

NODE=M002W

NODE=M002W

NEW

$\eta'(958)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
0.198±0.009 OUR FIT					
[0.199 ± 0.009 MeV OUR 2012 FIT]					
0.230±0.021 OUR AVERAGE					
0.226 ± 0.017 ± 0.014	2300	CZERWINSKI	10	MMS	$pp \rightarrow pp\eta'$
0.40 ± 0.22	4800	WURZINGER	96	SPEC	$1.68 pd \rightarrow {}^3He\eta'$
0.28 ± 0.10	1000	BINNIE	79	MMS	$0 \pi^- p \rightarrow nMM$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.20 ± 0.04		BAI	04J	BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$

η' (958) DECAY MODES

NODE=M002215;NODE=M002

Mode	Fraction (Γ_i/Γ)	Confidence level	
$\Gamma_1 \pi^+ \pi^- \eta$	(42.9 \pm 0.7) %		DESIG=1
$\Gamma_2 \rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$)	(29.1 \pm 0.5) %		DESIG=9
$\Gamma_3 \pi^0 \pi^0 \eta$	(22.2 \pm 0.8) %		DESIG=2
$\Gamma_4 \omega \gamma$	(2.75 \pm 0.23) %		DESIG=7
$\Gamma_5 \gamma \gamma$	(2.20 \pm 0.08) %		DESIG=6
$\Gamma_6 3\pi^0$	(2.14 \pm 0.20) $\times 10^{-3}$		DESIG=8
$\Gamma_7 \mu^+ \mu^- \gamma$	(1.08 \pm 0.27) $\times 10^{-4}$		DESIG=20
$\Gamma_8 \pi^+ \pi^- \mu^+ \mu^-$	< 2.2 $\times 10^{-4}$	90%	DESIG=201
$\Gamma_9 \pi^+ \pi^- \pi^0$	(3.8 \pm 0.4) $\times 10^{-3}$		DESIG=121
$\Gamma_{10} \pi^0 \rho^0$	< 4 %	90%	DESIG=18
$\Gamma_{11} 2(\pi^+ \pi^-)$	< 2.4 $\times 10^{-4}$	90%	DESIG=131
$\Gamma_{12} \pi^+ \pi^- 2\pi^0$	< 2.5 $\times 10^{-3}$	90%	DESIG=202
$\Gamma_{13} 2(\pi^+ \pi^-)$ neutrals	< 1 %	95%	DESIG=132
$\Gamma_{14} 2(\pi^+ \pi^-)\pi^0$	< 1.9 $\times 10^{-3}$	90%	DESIG=141
$\Gamma_{15} 2(\pi^+ \pi^-)2\pi^0$	< 1 %	95%	DESIG=15
$\Gamma_{16} 3(\pi^+ \pi^-)$	< 5 $\times 10^{-4}$	90%	DESIG=203
$\Gamma_{17} \pi^+ \pi^- e^+ e^-$	(2.4 \pm 1.3) $\times 10^{-3}$		DESIG=10
$\Gamma_{18} \pi^+ e^- \nu_e + \text{c.c.}$	< 2.1 $\times 10^{-4}$	90%	DESIG=204
$\Gamma_{19} \gamma e^+ e^-$	< 9 $\times 10^{-4}$	90%	DESIG=28
$\Gamma_{20} \pi^0 \gamma \gamma$	< 8 $\times 10^{-4}$	90%	DESIG=24
$\Gamma_{21} 4\pi^0$	< 5 $\times 10^{-4}$	90%	DESIG=26
$\Gamma_{22} e^+ e^-$	< 2.1 $\times 10^{-7}$	90%	DESIG=150
Γ_{23} invisible	< 5 $\times 10^{-4}$	90%	DESIG=200

**Charge conjugation (C), Parity (P),
Lepton family number (LF) violating modes**

NODE=M002;CLUMP=B

$\Gamma_{24} \pi^+ \pi^-$	P,CP	< 6	$\times 10^{-5}$	90%	DESIG=111
$\Gamma_{25} \pi^0 \pi^0$	P,CP	< 4	$\times 10^{-4}$	90%	DESIG=25
$\Gamma_{26} \pi^0 e^+ e^-$	C	[a] < 1.4	$\times 10^{-3}$	90%	DESIG=16
$\Gamma_{27} \eta e^+ e^-$	C	[a] < 2.4	$\times 10^{-3}$	90%	DESIG=17
$\Gamma_{28} 3\gamma$	C	< 1.0	$\times 10^{-4}$	90%	DESIG=23
$\Gamma_{29} \mu^+ \mu^- \pi^0$	C	[a] < 6.0	$\times 10^{-5}$	90%	DESIG=22
$\Gamma_{30} \mu^+ \mu^- \eta$	C	[a] < 1.5	$\times 10^{-5}$	90%	DESIG=21
$\Gamma_{31} e \mu$	LF	< 4.7	$\times 10^{-4}$	90%	DESIG=27

[a] C parity forbids this to occur as a single-photon process.

LINKAGE=CS

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, 2 combinations of partial widths obtained from integrated cross section, and 15 branching ratios uses 43 measurements and one constraint to determine 9 parameters. The overall fit has a $\chi^2 = 48.0$ for 35 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	0							
x_3	-76	-58						
x_4	-19	-23	4					
x_5	-29	-25	32	-1				
x_6	-24	-18	29	1	9			
x_9	0	-2	-3	-1	-1	-1		
x_{17}	-4	-6	-5	-2	-3	-2	0	
Γ	25	5	-19	5	-71	-5	1	3
	x_1	x_2	x_3	x_4	x_5	x_6	x_9	x_{17}

Mode	Rate (MeV)	
$\Gamma_1 \pi^+ \pi^- \eta$	0.085 ± 0.004	DESIG=1
$\Gamma_2 \rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$)	0.0575 ± 0.0028	DESIG=9
$\Gamma_3 \pi^0 \pi^0 \eta$	0.0439 ± 0.0023	DESIG=2
$\Gamma_4 \omega \gamma$	0.0054 ± 0.0005	DESIG=7
$\Gamma_5 \gamma \gamma$	0.00435 ± 0.00013	DESIG=6
$\Gamma_6 3\pi^0$	(4.2 ± 0.4) $\times 10^{-4}$	DESIG=8
$\Gamma_9 \pi^+ \pi^- \pi^0$	(7.5 ± 0.8) $\times 10^{-4}$	DESIG=121
$\Gamma_{17} \pi^+ \pi^- e^+ e^-$	(4.7 ± 2.6) $\times 10^{-4}$	DESIG=10

$\eta'(958)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$		Γ_5
VALUE (keV)	EVTS	DOCUMENT ID
4.35 ± 0.14 OUR FIT		
[4.34 ± 0.14 keV OUR 2012 FIT]		
4.28 ± 0.19 OUR AVERAGE		
4.17 $\pm 0.10 \pm 0.27$	2000	⁴ ACCIARRI 98Q L3 $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \gamma$
4.53 $\pm 0.29 \pm 0.51$	266	KARCH 92 CBAL $e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$
3.61 $\pm 0.13 \pm 0.48$		⁵ BEHREND 91 CELL $e^+ e^- \rightarrow e^+ e^- \eta'(958)$
4.6 $\pm 1.1 \pm 0.6$	23	BARU 90 MD1 $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \gamma$
4.57 $\pm 0.25 \pm 0.44$		BUTLER 90 MRK2 $e^+ e^- \rightarrow e^+ e^- \eta'(958)$
5.08 $\pm 0.24 \pm 0.71$	547	⁶ ROE 90 ASP $e^+ e^- \rightarrow e^+ e^- 2\gamma$
3.8 $\pm 0.7 \pm 0.6$	34	AIHARA 88C TPC $e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$
4.9 $\pm 0.5 \pm 0.5$	136	⁷ WILLIAMS 88 CBAL $e^+ e^- \rightarrow e^+ e^- 2\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •		
4.7 $\pm 0.6 \pm 0.9$	143	⁸ GIDAL 87 MRK2 $e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$
4.0 ± 0.9		⁹ BARTEL 85E JADE $e^+ e^- \rightarrow e^+ e^- 2\gamma$

NODE=M002220

NODE=M002W4

NODE=M002W4

NEW

⁴ No non-resonant $\pi^+ \pi^-$ contribution found.⁵ Reevaluated by us using $B(\eta' \rightarrow \rho(770)\gamma) = (30.2 \pm 1.3)\%$.⁶ Reevaluated by us using $B(\eta' \rightarrow \gamma\gamma) = (2.11 \pm 0.13)\%$.⁷ Reevaluated by us using $B(\eta' \rightarrow \gamma\gamma) = (2.11 \pm 0.13)\%$.⁸ Superseded by BUTLER 90.⁹ Systematic error not evaluated.

NODE=M002W4;LINKAGE=AC

NODE=M002W4;LINKAGE=K1

NODE=M002W4;LINKAGE=K2

NODE=M002W4;LINKAGE=K3

NODE=M002W4;LINKAGE=C

NODE=M002W4;LINKAGE=A

$\eta'(958) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

This combination of a partial width with the partial width into $\gamma\gamma$ and with the total width is obtained from the integrated cross section into channel(i) in the $\gamma\gamma$ annihilation.

$\Gamma(\gamma\gamma) \times \Gamma(\rho^0\gamma(\text{including non-resonant } \pi^+\pi^-\gamma))/\Gamma_{\text{total}}$		$\Gamma_5\Gamma_2/\Gamma$		
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT

 1.27 ± 0.04 OUR FIT **1.26 ± 0.07 OUR AVERAGE**

Error includes scale factor of 1.2.

$1.09 \pm 0.04 \pm 0.13$		BEHREND	91	CELL $e^+e^- \rightarrow e^+e^-\rho(770)^0\gamma$
$1.35 \pm 0.09 \pm 0.21$		AIHARA	87	TPC $e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.13 \pm 0.04 \pm 0.13$	867	ALBRECHT	87B	ARG $e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.53 \pm 0.09 \pm 0.21$		ALTHOFF	84E	TASS $e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.14 \pm 0.08 \pm 0.11$	243	BERGER	84B	PLUT $e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.73 \pm 0.34 \pm 0.35$	95	JENNI	83	MRK2 $e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.49 \pm 0.13 \pm 0.027$	213	BARTEL	82B	JADE $e^+e^- \rightarrow e^+e^-\rho\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.85 \pm 0.31 \pm 0.24$	43	BEHREND	83B	CELL $e^+e^- \rightarrow e^+e^-\rho\gamma$

 $\Gamma(\gamma\gamma) \times \Gamma(\pi^0\pi^0\eta)/\Gamma_{\text{total}}$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	------	-------------	------	---------

 0.97 ± 0.05 OUR FIT[0.94 ± 0.05 keV OUR 2012 FIT] **$0.92 \pm 0.06 \pm 0.11$** 10 KARCH 92 CBAL $e^+e^- \rightarrow e^+e^-\eta\pi^0\pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.95 \pm 0.05 \pm 0.08$		11 KARCH	90	CBAL $e^+e^- \rightarrow e^+e^-\eta\pi^0\pi^0$
$1.00 \pm 0.08 \pm 0.10$		11,12 ANTREASYAN	87	CBAL $e^+e^- \rightarrow e^+e^-\eta\pi^0\pi^0$

10 Reevaluated by us using $B(\eta \rightarrow \gamma\gamma) = (39.21 \pm 0.34)\%$. Supersedes ANTREASYAN 87 and KARCH 90.

11 Superseded by KARCH 92.

12 Using $BR(\eta \rightarrow 2\gamma) = (38.9 \pm 0.5)\%$. **$\eta'(958) \rightarrow \eta\pi\pi$ DECAY PARAMETERS**

$$|\text{MATRIX ELEMENT}|^2 = |1 + \alpha Y|^2 + CX + DX^2$$

X and Y are Dalitz variables; α is complex and C, and D are real-valued. Parameters C and D are not necessarily equal to c and d, respectively, in the generalized parameterization following this one. May be different for $\eta'(958) \rightarrow \eta\pi^+\pi^-$ and $\eta'(958) \rightarrow \eta\pi^0\pi^0$ decays. Because of different initial assumptions and strong correlations of the parameters we do not average the parameters in the section below.

 $\text{Re}(\alpha)$ decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$-0.033 \pm 0.005 \pm 0.003$	44k	13 ABLIKIM	11	BES3 $J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
$-0.072 \pm 0.012 \pm 0.006$	7k	14 AMELIN	05A	VES $28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$
$-0.021 \pm 0.018 \pm 0.017$	6.7k	15 BRIERE	00	CLEO $10.6\pi^+e^- \rightarrow \eta\pi^+\pi^-X$
$-0.058 \pm 0.013 \pm 0.003$	5.4k	16 ALDE	86	GAM2 $38\pi^-\rho \rightarrow n\eta\pi^0\pi^0$
-0.08 ± 0.03		16,17 KALBFLEISCH	74	RVUE $\eta' \rightarrow \eta\pi^+\pi^-$

13 See ABLIKIM 11 for the full correlation matrix.

14 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

15 Assuming $\text{Im}(\alpha) = 0$, C = 0, and D = 0.

16 Assuming C = 0.

17 From the data of DAUBER 64, RITTENBERG 69, AGUILAR-BENITEZ 72B, JACOBS 73, and DANBURG 73.

NODE=M002223

NODE=M002223

NODE=M002G1

NODE=M002G1

NODE=M002G2

NODE=M002G2

NEW

NODE=M002G2;LINKAGE=K4

NODE=M002G2;LINKAGE=A

NODE=M002G2;LINKAGE=D

NODE=M002225

NODE=M002225

NODE=M002A0

NODE=M002A0

NODE=M002A0;LINKAGE=AB

NODE=M002A0;LINKAGE=AM

NODE=M002A0;LINKAGE=BR

NODE=M002A0;LINKAGE=A

NODE=M002A0;LINKAGE=KA

Im(α) decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.000±0.049±0.001	44k	18 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
0.0 ±0.1 ±0.0	7k	19 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$
-0.00 ±0.13 ±0.00	5.4k	20 ALDE	86 GAM2	$38\pi^-p \rightarrow n\eta\pi^0\pi^0$
0.0 ±0.3	20,21 KALBFLEISCH	74 RVUE		$\eta' \rightarrow \eta\pi^+\pi^-$

18 See ABLIKIM 11 for the full correlation matrix.

19 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

20 Assuming $C = 0$.

21 From the data of DAUBER 64, RITTENBERG 69, AGUILAR-BENITEZ 72B, JACOBS 73, and DANBURG 73.

C decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.018±0.009±0.003	44k	22 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
0.020±0.018±0.004	7k	23 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$

22 See ABLIKIM 11 for the full correlation matrix.

23 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

D decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.059±0.012±0.004	44k	24 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.066±0.030±0.015	7k	25 AMELIN	05A VES	$28\pi^-A \rightarrow \eta\pi^+\pi^-\pi^-A^*$
0.00 ±0.03 ±0.00	5.4k	26 ALDE	86 GAM2	$38\pi^-p \rightarrow n\eta\pi^0\pi^0$
0	26,27 KALBFLEISCH	74 RVUE		$\eta' \rightarrow \eta\pi^+\pi^-$

24 See ABLIKIM 11 for the full correlation matrix.

25 Superseded by DOROFEEV 07, which found this parameterization unacceptable. See below.

26 Assuming $C = 0$.

27 From the data of DAUBER 64, RITTENBERG 69, AGUILAR-BENITEZ 72B, JACOBS 73, and DANBURG 73.

 $\eta'(958) \rightarrow \eta\pi\pi$ DECAY PARAMETERS

$$|\text{MATRIX ELEMENT}|^2 \propto 1 + a Y + b Y^2 + c X + d X^2$$

X and Y are Dalitz variables and a , b , c , and d are real-valued parameters.May be different for $\eta'(958) \rightarrow \eta\pi^+\pi^-$ and $\eta'(958) \rightarrow \eta\pi^0\pi^0$ decays.

We do not average measurements in the section below because parameter values from each experiment are strongly correlated.

a decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.047±0.011±0.003	44k	28 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.066±0.016±0.003	15k	29 BLIK	09 GAM4	$32.5\pi^-p \rightarrow \eta'n$
-0.127±0.016±0.008	20k	30 DOROFEEV	07 VES	$27\pi^-p \rightarrow \eta'n,$ $\pi^-A \rightarrow \eta'\pi^-A^*$

28 See ABLIKIM 11 for the full correlation matrix.

29 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay.30 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.***b decay parameter***

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.069±0.019±0.009	44k	31 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.063±0.028±0.004	15k	32 BLIK	09 GAM4	$32.5\pi^-p \rightarrow \eta'n$
-0.106±0.028±0.014	20k	33 DOROFEEV	07 VES	$27\pi^-p \rightarrow \eta'n,$ $\pi^-A \rightarrow \eta'\pi^-A^*$

31 See ABLIKIM 11 for the full correlation matrix.

32 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay.33 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002IA0

NODE=M002IA0

NODE=M002IA0;LINKAGE=AB

NODE=M002IA0;LINKAGE=AM

NODE=M002IA0;LINKAGE=A

NODE=M002IA0;LINKAGE=KA

NODE=M002C0

NODE=M002C0

NODE=M002C0;LINKAGE=AB

NODE=M002C0;LINKAGE=AM

NODE=M002D0

NODE=M002D0

NODE=M002D0;LINKAGE=AB

NODE=M002D0;LINKAGE=AM

NODE=M002D0;LINKAGE=AL

NODE=M002D0;LINKAGE=KA

NODE=M002227

NODE=M002227

NODE=M002DPA

NODE=M002DPA

NODE=M002DPA;LINKAGE=AB

NODE=M002DPA;LINKAGE=BL

NODE=M002DPA;LINKAGE=DO

NODE=M002DPB

NODE=M002DPB

NODE=M002DPB;LINKAGE=AB

NODE=M002DPB;LINKAGE=BL

NODE=M002DPB;LINKAGE=DO

c decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.019±0.011±0.003	44k	34 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
-0.107±0.096±0.003	15k	35 BLIK	09 GAM4	$32.5\pi^- p \rightarrow \eta' n$
0.015±0.011±0.014	20k	36 DOROFEEV	07 VES	$27\pi^- p \rightarrow \eta' n, \pi^- A \rightarrow \eta' \pi^- A^*$

34 See ABLIKIM 11 for the full correlation matrix.

35 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay.36 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002DPC

NODE=M002DPC

d decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.073±0.012±0.003	44k	37 ABLIKIM	11 BES3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
0.018±0.078±0.006	15k	38 BLIK	09 GAM4	$32.5\pi^- p \rightarrow \eta' n$
-0.082±0.017±0.008	20k	39 DOROFEEV	07 VES	$27\pi^- p \rightarrow \eta' n, \pi^- A \rightarrow \eta' \pi^- A^*$

37 See ABLIKIM 11 for the full correlation matrix.

38 From $\eta' \rightarrow \eta\pi^0\pi^0$ decay. If $c \equiv 0$ from Bose-Einstein symmetry, $d = -0.067 \pm 0.020 \pm 0.003$.39 From $\eta' \rightarrow \eta\pi^+\pi^-$ decay.

NODE=M002DPC;LINKAGE=AB

NODE=M002DPC;LINKAGE=BL

NODE=M002DPC;LINKAGE=DO

NODE=M002DPD

NODE=M002DPD

$\eta'(958)$ β PARAMETER |MATRIX ELEMENT|² = (1 + 2 βZ)

See the "Note on η Decay Parameters" in our 1994 edition Physical Review D**50** 1173 (1994), p. 1454.

 β decay parameter

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-0.46±0.22 OUR AVERAGE				Error includes scale factor of 1.4.
-0.59±0.18	235	BLIK	08 GAMS	$32\pi^- p \rightarrow \eta' n$
-0.1 ±0.3		ALDE	87B GAM2	$38\pi^- p \rightarrow n3\pi^0$

 $\eta'(958)$ BRANCHING RATIOS **$\Gamma(\pi^+\pi^-\eta)/\Gamma_{\text{total}}$** **$\Gamma_1/\Gamma$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.429±0.007 OUR FIT				[0.434 ± 0.007 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •0.424±0.011±0.004 1.2k 40 PEDLAR 09 CLEO $J/\psi \rightarrow \gamma\eta'$ 40 Not independent of other η' branching fractions and ratios in PEDLAR 09.

NODE=M002226

NODE=M002226

 $\Gamma(\pi^+\pi^-\eta(\text{charged decay}))/\Gamma_{\text{total}}$ **$0.286\Gamma_1/\Gamma$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.1228±0.0020 OUR FIT				[0.1240 ± 0.0020 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.123 ± 0.014	107	RITTENBERG 69	HBC	1.7–2.7 $K^- p$
0.10 ± 0.04	10	LONDON	66	HBC 2.24 $K^- p \rightarrow \Lambda 2\pi^+ 2\pi^- \pi^0$
0.07 ± 0.04	7	BADIER	65B	HBC 3 $K^- p$

NODE=M002B0

NODE=M002B0

 $\Gamma(\pi^+\pi^-\eta(\text{neutral decay}))/\Gamma_{\text{total}}$ **$0.714\Gamma_1/\Gamma$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.307±0.005 OUR FIT				[0.310 ± 0.005 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •0.314±0.026 281 RITTENBERG 69 HBC 1.7–2.7 $K^- p$

NODE=M002R47

NODE=M002R47

NEW

NODE=M002R47;LINKAGE=PE

NODE=M002R3

NODE=M002R3

NEW

NODE=M002R1

NODE=M002R1

NEW

$\Gamma(\rho^0 \gamma (\text{including non-resonant } \pi^+ \pi^- \gamma)) / \Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
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0.291±0.006 OUR FIT

[0.293 ± 0.006 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.287±0.007±0.004	0.2k	41 PEDLAR	09 CLEO	$J/\psi \rightarrow \gamma \eta'$	
0.329±0.033	298	RITTENBERG	69 HBC	1.7–2.7 $K^- p$	
0.2 ± 0.1	20	LONDON	66 HBC	$2.24 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$	
0.34 ± 0.09	35	BADIER	65B HBC	3 $K^- p$	

41 Not independent of other η' branching fractions and ratios in PEDLAR 09.

NODE=M002R6

NODE=M002R6

NEW

 $\Gamma(\rho^0 \gamma (\text{including non-resonant } \pi^+ \pi^- \gamma)) / \Gamma(\pi^+ \pi^- \eta)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_1
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0.677±0.017 OUR FIT

[0.676 ± 0.017 OUR 2012 FIT]

0.683±0.020 OUR AVERAGE

0.677±0.024±0.011		PEDLAR	09 CLE3	$J/\psi \rightarrow \eta' \gamma$	
0.69 ± 0.03		ABLIKIM	06E BES2	$J/\psi \rightarrow \eta' \gamma$	

NODE=M002R6;LINKAGE=PE

NODE=M002R43

NODE=M002R43

NEW

 $\Gamma(\rho^0 \gamma (\text{including non-resonant } \pi^+ \pi^- \gamma)) / \Gamma(\pi^+ \pi^- \eta (\text{neutral decay}))$

$\Gamma_2/0.714\Gamma_1$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_2/0.714\Gamma_1$
-------	------	-------------	------	---------	--------------------------

0.949±0.024 OUR FIT

[0.947 ± 0.024 OUR 2012 FIT]

0.97 ± 0.09 OUR AVERAGE

0.70 ± 0.22		AMSLER	04B CBAR	$0 \bar{p} p \rightarrow \pi^+ \pi^- \eta$	
1.07 ± 0.17		BELADIDZE	92C VES	$36 \pi^- \text{Be} \rightarrow \pi^- \eta' \eta \text{Be}$	
0.92 ± 0.14	473	DANBURG	73 HBC	$2.2 K^- p \rightarrow \Lambda X^0$	
1.11 ± 0.18	192	JACOBS	73 HBC	$2.9 K^- p \rightarrow \Lambda X^0$	

NODE=M002R27

NODE=M002R27

NEW

 $\Gamma(\pi^0 \pi^0 \eta) / \Gamma_{\text{total}}$

Γ_3/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
-------	------	-------------	------	---------	-------------------

0.222±0.008 OUR FIT

[0.216 ± 0.008 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.235±0.013±0.004	3.2k	42 PEDLAR	09 CLEO	$J/\psi \rightarrow \gamma \eta'$	
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42 Not independent of other η' branching fractions and ratios in PEDLAR 09.

NODE=M002R48

NODE=M002R48

NEW

NODE=M002R48;LINKAGE=PE

 $\Gamma(\pi^0 \pi^0 \eta (3\pi^0 \text{decay})) / \Gamma_{\text{total}}$

$0.321\Gamma_3/\Gamma$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	$0.321\Gamma_3/\Gamma$
-------	------	-------------	------	---------	------------------------

0.0712±0.0026 OUR FIT

[0.0694 ± 0.0026 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.11 ± 0.06	4	BENSINGER	70 DBC	$2.2 \pi^+ d$	
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NODE=M002R26

NODE=M002R26

NEW

 $\Gamma(\pi^0 \pi^0 \eta) / \Gamma(\pi^+ \pi^- \eta)$

Γ_3/Γ_1

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_1
-------	------	-------------	------	---------	---------------------

0.517±0.026 OUR FIT

[0.498 ± 0.025 OUR 2012 FIT]

0.555±0.043±0.013

		PEDLAR	09 CLE3	$J/\psi \rightarrow \eta' \gamma$	
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NODE=M002R45

NODE=M002R45

NEW

 $\Gamma(\rho^0 \gamma (\text{including non-resonant } \pi^+ \pi^- \gamma)) / \Gamma(\pi \pi \eta)$

$\Gamma_2/(\Gamma_1 + \Gamma_3)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_2/(\Gamma_1 + \Gamma_3)$
-------	------	-------------	------	---------	----------------------------------

0.447±0.012 OUR FIT

[0.451 ± 0.012 OUR 2012 FIT]

0.43 ± 0.02 ± 0.02

		BARBERIS	98C OMEG	$450 pp \rightarrow p_f \eta' p_s$	
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.31 ± 0.15		DAVIS	68 HBC	$5.5 K^- p$	
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NODE=M002R7

NODE=M002R7

NEW

NODE=M002R49

NODE=M002R49

NEW

 $\Gamma(\omega \gamma) / \Gamma_{\text{total}}$

Γ_4/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
-------	------	-------------	------	---------	-------------------

0.0275±0.0023 OUR FIT

[0.0275 ± 0.0022 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0234±0.0030±0.0004	70	43 PEDLAR	09 CLEO	$J/\psi \rightarrow \gamma \eta'$	
----------------------	----	-----------	---------	-----------------------------------	--

43 Not independent of other η' branching fractions and ratios in PEDLAR 09.

NODE=M002R49;LINKAGE=PE

$\Gamma(\omega\gamma)/\Gamma(\pi^+\pi^-\eta)$					Γ_4/Γ_1
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.064±0.006 OUR FIT [0.063 ± 0.005 OUR 2012 FIT]					NODE=M002R17 NODE=M002R17 NEW
0.055±0.007±0.001	PEDLAR	09	CLE3	$J/\psi \rightarrow \eta'/\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.068±0.013	68	ZANFINO	77	ASPK $\pi^- p$	
$\Gamma(\omega\gamma)/\Gamma(\pi^0\pi^0\eta)$					Γ_4/Γ_3
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.124±0.011 OUR FIT [0.127 ± 0.011 OUR 2012 FIT]					NODE=M002R33 NODE=M002R33 NEW
0.147±0.016	ALDE	87B	GAM2	$38 \pi^- p \rightarrow n4\gamma$	
$\Gamma(\rho^0\gamma(\text{including non-resonant } \pi^+\pi^-\gamma))/[\Gamma(\pi^+\pi^-\eta) + \Gamma(\pi^0\pi^0\eta) + \Gamma(\omega\gamma)]$					$\Gamma_2/(\Gamma_1+\Gamma_3+\Gamma_4)$
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.428±0.011 OUR FIT [0.433 ± 0.012 OUR 2012 FIT]					NODE=M002R18 NODE=M002R18 NEW
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.25 ± 0.14	DAUBER	64	HBC	$1.95 K^- p$	
$[\Gamma(\pi^0\pi^0\eta(\text{charged decay})) + \Gamma(\omega(\text{charged decay})\gamma)]/\Gamma_{\text{total}}$					$(0.286\Gamma_3+0.89\Gamma_4)/\Gamma$
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.0880±0.0031 OUR FIT [0.0863 ± 0.0032 OUR 2012 FIT]					NODE=M002R4 NODE=M002R4 NEW
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.045 ± 0.029	42	RITTENBERG	69	HBC $1.7-2.7 K^- p$	
$\Gamma(\pi^+\pi^- \text{ neutrals})/\Gamma_{\text{total}}$					$(0.714\Gamma_1+0.286\Gamma_3+0.89\Gamma_4)/\Gamma$
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.395±0.004 OUR FIT [0.396 ± 0.004 OUR 2012 FIT]					NODE=M002R2 NODE=M002R2 NEW
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.4 ± 0.1	39	LONDON	66	HBC $2.24 K^- p \rightarrow \Lambda\pi^+\pi^- \text{ neutrals}$	
0.35 ± 0.06	33	BADIER	65B	HBC $3 K^- p$	
$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.20±0.08 OUR FIT [(2.18 ± 0.08) × 10^{-2} OUR 2012 FIT]					NODE=M002R19 NODE=M002R19 NEW
2.00±0.15 OUR AVERAGE					
1.98 ^{+0.31} _{-0.27} ± 0.07	114	44 WICHT	08	BELL $B^\pm \rightarrow K^\pm\gamma\gamma$	
2.00 ± 0.18		45 STANTON	80	SPEC $8.45 \pi^- p \rightarrow n\pi^+\pi^- 2\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.25 ± 0.16 ± 0.03	0.3k	46 PEDLAR	09	CLEO $J/\psi \rightarrow \gamma\eta'$	
1.8 ± 0.2	6000	47 APEL	79	NICE $15-40 \pi^- p \rightarrow n2\gamma$	
2.5 ± 0.7		DUANE	74	MMS $\pi^- p \rightarrow nMM$	
1.71 ± 0.33	68	DALPIAZ	72	CNTR $1.6 \pi^- p \rightarrow nX^0$	
2.0 ± 0.8	31	HARVEY	71	OSPK $3.65 \pi^- p \rightarrow nX^0$	
44 WICHT 08 reports $[\Gamma(\eta'(958) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta'K^+)] = (1.40^{+0.16+0.15}_{-0.15-0.12}) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta'K^+) = (7.06 \pm 0.25) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
45 Includes APEL 79 result.					
46 Not independent of other η' branching fractions and ratios in PEDLAR 09.					
47 Data is included in STANTON 80 evaluation.					
$\Gamma(\gamma\gamma)/\Gamma(\pi^+\pi^-\eta)$					Γ_5/Γ_1
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.0513±0.0022 OUR FIT [0.0503 ± 0.0022 OUR 2012 FIT]					NODE=M002R46 NODE=M002R46 NEW
0.053 ± 0.004 ± 0.001	PEDLAR	09	CLE3	$J/\psi \rightarrow \eta'\gamma$	

$\Gamma(\gamma\gamma)/\Gamma(\rho^0\gamma \text{ (including non-resonant } \pi^+\pi^-\gamma))$	Γ_5/Γ_2	NODE=M002R42 NODE=M002R42 NEW
0.075±0.0033 OUR FIT [0.0744 ± 0.0033 OUR 2012 FIT]	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>
0.080 ± 0.008	ABLIKIM	06E BES2 $J/\psi \rightarrow \eta'\gamma$
$\Gamma(\gamma\gamma)/\Gamma(\pi^0\pi^0\eta)$	Γ_5/Γ_3	NODE=M002R38 NODE=M002R38 NEW
0.099±0.004 OUR FIT [0.101 ± 0.004 OUR 2012 FIT]	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>
0.105±0.010 OUR AVERAGE	Error includes scale factor of 1.9.	
0.091±0.009	AMSLER	93 CBAR 0.0 $\bar{p}p$
0.112±0.002±0.006	ALDE	87B GAM2 38 $\pi^- p \rightarrow n2\gamma$
$\Gamma(\gamma\gamma)/\Gamma(\pi^0\pi^0\eta \text{ (neutral decay)})$	$\Gamma_5/0.714\Gamma_3$	NODE=M002R28 NODE=M002R28 NEW
0.139±0.006 OUR FIT [0.141 ± 0.006 OUR 2012 FIT]	<u>EVTS</u>	<u>DOCUMENT ID</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •		
0.188±0.058	16	APEL 72 OSPK 3.8 $\pi^- p \rightarrow nX^0$
$\Gamma(\text{ neutrals})/\Gamma_{\text{total}}$	$(0.714\Gamma_3+0.09\Gamma_4+\Gamma_5)/\Gamma$	NODE=M002R5 NODE=M002R5 NEW
0.183±0.006 OUR FIT [0.179 ± 0.006 OUR 2012 FIT]	<u>EVTS</u>	<u>DOCUMENT ID</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •		
0.185±0.022	535	BASILE 71 CNTR 1.6 $\pi^- p \rightarrow nX^0$
0.189±0.026	123	RITTENBERG 69 HBC 1.7–2.7 $K^- p$
$\Gamma(3\pi^0)/\Gamma_{\text{total}}$	Γ_6/Γ	NODE=M002R55 NODE=M002R55
2.14±0.20 OUR FIT	<u>EVTS</u>	<u>DOCUMENT ID</u>
3.56±0.22±0.34	309	ABLIKIM 12E BES3 $J/\psi \rightarrow \gamma(3\pi^0)$
$\Gamma(3\pi^0)/\Gamma(\pi^0\pi^0\eta)$	Γ_6/Γ_3	NODE=M002R32 NODE=M002R32 NEW
96± 9 OUR FIT [(78 ± 10) × 10 ⁻⁴ OUR 2012 FIT]	<u>EVTS</u>	<u>DOCUMENT ID</u>
78±10 OUR AVERAGE		
86±19	235	BLIK 08 GAMS 32 $\pi^- p \rightarrow \eta' n$
74±15		ALDE 87B GAM2 38 $\pi^- p \rightarrow n6\gamma$
75±18		BINON 84 GAM2 30–40 $\pi^- p \rightarrow n6\gamma$
$\Gamma(\mu^+\mu^-\gamma)/\Gamma(\gamma\gamma)$	Γ_7/Γ_5	NODE=M002R29 NODE=M002R29
4.9±1.2	<u>EVTS</u>	<u>DOCUMENT ID</u>
4.9±1.2	33	VIKTOROV 80 CNTR 25,33 $\pi^- p \rightarrow 2\mu\gamma$
$\Gamma(\pi^+\pi^-\mu^+\mu^-)/\Gamma_{\text{total}}$	Γ_8/Γ	NODE=M002R50 NODE=M002R50
<2.4	<u>CL%</u>	<u>DOCUMENT ID</u>
<2.4	90	NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$
48 Not independent of measured value of Γ_8/Γ_1 from NAIK 09.		
$\Gamma(\pi^+\pi^-\mu^+\mu^-)/\Gamma(\pi^+\pi^-\eta)$	Γ_8/Γ_1	NODE=M002R50;LINKAGE=NA
<0.5	<u>CL%</u>	<u>DOCUMENT ID</u>
<0.5	90	NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$
49 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\mu^+\mu^-)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 1.3 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.		
$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$	Γ_9/Γ	NODE=M002R03 NODE=M002R03
3.8 ±0.4 OUR FIT [(0.36 ^{+0.11} – _{0.09}) × 10 ⁻² OUR 2012 FIT]	<u>EVTS</u>	<u>DOCUMENT ID</u>
3.8 ± 0.4 OUR AVERAGE		
3.83±0.15±0.39	1014	ABLIKIM 12E BES3 $J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^0)$
3.7 ^{+1.1} _{-0.9} ± 0.4	50	NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$
50 Not independent of measured value of Γ_9/Γ_1 from NAIK 09.		
		NODE=M002R21;LINKAGE=NA

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma(\pi^+\pi^-\eta)$	Γ_9/Γ_1			
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT

8.8 ± 0.9 OUR FIT[(8.3 $^{+2.5}_{-2.1}$) × 10 $^{-3}$ OUR 2012 FIT]**8.28 $^{+2.49}_{-2.12}$ ± 0.04** 20 51 NAIK 09 CLEO $J/\psi \rightarrow \gamma\eta'$

51 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\pi^0)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] = (21^{+6}_{-5} \pm 2) \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^0\rho^0)/\Gamma_{\text{total}}$	Γ_{10}/Γ			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.04	90	RITTENBERG 65	HBC	$2.7 K^- p$

 $\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

< 2.4	90	52 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$
<100	90	RITTENBERG 69	HBC	$1.7\text{--}2.7 K^- p$

52 Not independent of measured value of Γ_{11}/Γ_1 from NAIK 09.

$\Gamma(2(\pi^+\pi^-))/\Gamma(\pi^+\pi^-\eta)$	Γ_{11}/Γ_1			
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<0.6	90	53 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$

53 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow 2(\pi^+\pi^-))/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 1.4 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.

$\Gamma(\pi^+\pi^-2\pi^0)/\Gamma_{\text{total}}$	Γ_{12}/Γ			
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<27	90	54 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$

54 Not independent of measured value of Γ_{12}/Γ_1 from NAIK 09.

$\Gamma(\pi^+\pi^-2\pi^0)/\Gamma(\pi^+\pi^-\eta)$	Γ_{12}/Γ_1			
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<6	90	55 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$

55 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-2\pi^0)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 15 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.

$\Gamma(2(\pi^+\pi^-)\text{ neutrals})/\Gamma_{\text{total}}$	Γ_{13}/Γ_1			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.01	95	DANBURG 73	HBC	$2.2 K^- p \rightarrow \Lambda X^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.01	90	RITTENBERG 69	HBC	$1.7\text{--}2.7 K^- p$
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$\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$	Γ_{14}/Γ			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.002	90	56 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$

<0.01	90	RITTENBERG 69	HBC	$1.7\text{--}2.7 K^- p$
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56 Not independent of measured value of Γ_{14}/Γ_1 from NAIK 09.

$\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma(\pi^+\pi^-\eta)$	Γ_{14}/Γ_1			
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<4	90	57 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$

57 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow 2(\pi^+\pi^-)\pi^0)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 11 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.

NODE=M002R01

NODE=M002R01

NEW

NODE=M002R01;LINKAGE=NA

NODE=M002R10

NODE=M002R10

NODE=M002R24

NODE=M002R24

NODE=M002R24;LINKAGE=NA

NODE=M002R04

NODE=M002R04

NODE=M002R04;LINKAGE=NA

NODE=M002R51

NODE=M002R51

NODE=M002R51;LINKAGE=NA

NODE=M002R05

NODE=M002R05

NODE=M002R05;LINKAGE=NA

NODE=M002R22

NODE=M002R22

NODE=M002R23

NODE=M002R23

NODE=M002R23;LINKAGE=NA

NODE=M002R06

NODE=M002R06

NODE=M002R06;LINKAGE=NA

$\Gamma(2(\pi^+\pi^-)2\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{15}/Γ
<0.01	95	KALBFLEISCH 64B	HBC	$K^- p \rightarrow \Lambda(2(\pi^+\pi^-)+\text{MM}$	NODE=M002R16 NODE=M002R16
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.01	90	London	66	HBC Compilation	

 $\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{16}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.53	90	58 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$	NODE=M002R07 NODE=M002R07
<5	95	KALBFLEISCH 64B	HBC	$K^- p \rightarrow \Lambda(2(\pi^+\pi^-))$	
58 Not independent of measured value of Γ_{16}/Γ_1 from NAIK 09.					

 $\Gamma(3(\pi^+\pi^-))/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{16}/Γ_1
<1.2	90	59 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$	NODE=M002R08 NODE=M002R08
59 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow 3(\pi^+\pi^-))/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 3.0 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.					

 $\Gamma(\pi^+\pi^-e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{17}/Γ
2.4^{+1.3}_{-1.0} OUR FIT					NODE=M002R12 NODE=M002R12

• • • We do not use the following data for averages, fits, limits, etc. • • •

$2.5^{+1.2}_{-0.9} \pm 0.5$	60 NAIK	09	CLEO	$J/\psi \rightarrow \gamma\eta'$	
<6	90	RITTENBERG 65	HBC	$2.7 K^- p$	

60 Not independent of measured value of Γ_{17}/Γ_1 from NAIK 09.

 $\Gamma(\pi^+\pi^-e^+e^-)/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{17}/Γ_1
5.6^{+3.0}_{-2.2} OUR FIT		61 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$	NODE=M002R02 NODE=M002R02

5.52^{+3.00}_{-2.30} ± 0.3	8	61 NAIK	09	CLEO $J/\psi \rightarrow \gamma\eta'$	
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61 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-e^+e^-)/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] = (14^{+7}_{-5} \pm 3) \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\pi^+e^-\nu_e + \text{c.c.})/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{18}/Γ_1
<5.0	90	ABLIKIM	13G	BES3 $J/\psi \rightarrow \phi\eta'$	NODE=M002R54 NODE=M002R54

 $\Gamma(\gamma e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{19}/Γ
<0.9	90	BRIERE	00	CLEO $10.6 e^+e^-$	NODE=M002R40 NODE=M002R40

 $\Gamma(\pi^0\gamma\gamma)/\Gamma(\pi^0\pi^0\eta)$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{20}/Γ_3
<37	90	ALDE	87B	GAM2 $38 \pi^- p \rightarrow n4\gamma$	NODE=M002R35 NODE=M002R35

 $\Gamma(4\pi^0)/\Gamma(\pi^0\pi^0\eta)$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{21}/Γ_3
<23	90	ALDE	87B	GAM2 $38 \pi^- p \rightarrow n8\gamma$	NODE=M002R37 NODE=M002R37

 $\Gamma(e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-7})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{22}/Γ
<2.1	90	VOROBYEV	88	ND $e^+e^- \rightarrow \pi^+\pi^-\eta$	NODE=M002R39 NODE=M002R39

$\Gamma(\text{invisible})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<9.5	90	62 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
62 Not independent of measured value of Γ_{23}/Γ_1 from NAIK 09.				

 Γ_{23}/Γ NODE=M002R52
NODE=M002R52 $\Gamma(\text{invisible})/\Gamma(\gamma\gamma)$

<u>VALUE</u> (units 10^{-2})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.4 (CL = 90%)	[< 6.69×10^{-2} (CL = 90%) OUR 2008 BEST LIMIT]			
<2.4	90	ABLIKIM	13 BES3	$J/\psi \rightarrow \phi\eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<6.69	90	ABLIKIM	06Q BES	$J/\psi \rightarrow \phi\eta'$

 Γ_{23}/Γ_5 NODE=M002R44
NODE=M002R44 $\Gamma(\text{invisible})/\Gamma(\pi^+\pi^-\eta)$

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<2.1	90	63 NAIK	09 CLEO	$J/\psi \rightarrow \gamma\eta'$
63 NAIK 09 reports $[\Gamma(\eta'(958) \rightarrow \text{invisible})/\Gamma(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [B(\eta \rightarrow 2\gamma)] < 5.4 \times 10^{-3}$ which we multiply by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.				

 Γ_{23}/Γ_1 NODE=M002R09
NODE=M002R09 $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
< 0.6	90	64 ABLIKIM	11G BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

 Γ_{24}/Γ NODE=M002R20
NODE=M002R20 $\Gamma(\eta'/\pi^0\pi^0)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<4 x 10 ⁻⁴	90	67 ABLIKIM	11G BES3	$J/\psi \rightarrow \gamma\pi^0\pi^0$
64 ABLIKIM 11G reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta'(958))] < 2.84 \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta'(958)) = 5.16 \times 10^{-3}$.				
65 Taking into account interference with the $\gamma\gamma \rightarrow \pi^+\pi^-$ continuum.				
66 Without interference with the $\gamma\gamma \rightarrow \pi^+\pi^-$ continuum.				

 Γ_{25}/Γ NODE=M002R53
NODE=M002R53 $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<4 x 10 ⁻⁴	90	67 ABLIKIM	11G BES3	$J/\psi \rightarrow \gamma\pi^0\pi^0$
67 ABLIKIM 11G reports $[\Gamma(\eta'(958) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta'(958))] < 2.84 \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta'(958)) = 5.16 \times 10^{-3}$.				

 $\Gamma(\pi^0\pi^0)/\Gamma(\pi^0\pi^0\eta)$

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<45	90	ALDE	87B GAM2	$38\pi^-p \rightarrow n4\gamma$

 Γ_{25}/Γ_3 NODE=M002R36
NODE=M002R36 $\Gamma(\pi^0e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1.4	90	BRIERE	00 CLEO	$10.6 e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<13				

 Γ_{26}/Γ NODE=M002R8
NODE=M002R8 $\Gamma(\eta e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.4	90	BRIERE	00 CLEO	$10.6 e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<11				

 Γ_{27}/Γ NODE=M002R9
NODE=M002R9 $\Gamma(3\gamma)/\Gamma(\pi^0\pi^0\eta)$

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<4.6	90	ALDE	87B GAM2	$38\pi^-p \rightarrow n3\gamma$

 Γ_{28}/Γ_3 NODE=M002R34
NODE=M002R34 $\Gamma(\mu^+\mu^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<6.0	90	DZHELYADIN	81 CNTR	$30\pi^-p \rightarrow \eta'n$

 Γ_{29}/Γ NODE=M002R31
NODE=M002R31

$\Gamma(\mu^+ \mu^- \eta)/\Gamma_{\text{total}}$				Γ_{30}/Γ	
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.5	90	DZHELYADIN 81	CNTR	$30 \pi^- p \rightarrow \eta' n$	
$\Gamma(e\mu)/\Gamma_{\text{total}}$				Γ_{31}/Γ	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<4.7	90	BRIERE 00	CLEO	$10.6 e^+ e^-$	

$\eta'(958)$ C-NONCONSERVING DECAY PARAMETER

See the note on η decay parameters in the Stable Particle Particle Listings for definition of this parameter.

DECAY ASYMMETRY PARAMETER FOR $\pi^+ \pi^- \gamma$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
-0.03 ± 0.04 OUR AVERAGE					
-0.019 ± 0.056		AIHARA 87	TPC	$2\gamma \rightarrow \pi^+ \pi^- \gamma$	
-0.069 ± 0.078	295	GRIGORIAN 75	STRC	$2.1 \pi^- p$	
0.00 ± 0.10	103	KALBFLEISCH 75	HBC	$2.18 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.07 ± 0.08	152	RITTENBERG 65	HBC	$2.1-2.7 K^- p$	

$\eta'(958)$ REFERENCES

ABLIKIM	13	PR D87 012009	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54829
ABLIKIM	13G	PR D87 032006	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54952
ABLIKIM	12E	PRL 108 182001	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54270
ABLIKIM	11	PR D83 012003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53646
ABLIKIM	11G	PR D84 032006	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53711
CZERWINSKI	10	PRL 105 122001	E. Czerwinski <i>et al.</i>	(COSY-11 Collab.)	REFID=53364
BLIK	09	PAN 72 231	A.M. Blik <i>et al.</i>	(IHEP (Protvino))	REFID=52727
		Translated from YAF 72 258.			
NAIK	09	PRL 102 061801	P. Naik <i>et al.</i>	(CLEO Collab.)	REFID=52678
PEDLAR	09	PR D79 111101	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)	REFID=52998
BLIK	08	PAN 71 2124	A. Blik <i>et al.</i>	(GAMS-4π Collab.)	REFID=52663
		Translated from YAF 71 2161.			
LIBBY	08	PRL 101 182002	J. Libby <i>et al.</i>	(CLEO Collab.)	REFID=52591
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)	REFID=52204
DOROFEEV	07	PL B651 22	V. Dorofeev <i>et al.</i>	(VES Collab.)	REFID=51711
MORI	07A	JPSJ 76 074102	T. Mori <i>et al.</i>	(BELLE Collab.)	REFID=51691
ABLIKIM	06E	PR D73 052008	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51057
ABLIKIM	06Q	PRL 97 202002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51487
AMELIN	05A	PAN 68 372	D.V. Amelin <i>et al.</i>	(VES Collab.)	REFID=50766
		Translated from YAF 68 401.			
AMSLER	04B	EPJ C33 23	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=51079
BAI	04J	PL B594 47	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50167
BRIERE	00	PRL 84 26	R. Briere <i>et al.</i>	(CLEO Collab.)	REFID=47410
ACCIARRI	98Q	PL B418 399	M. Acciari <i>et al.</i>	(L3 Collab.)	REFID=46316
BARBERIS	98C	PL B440 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=46346
WURZINGER	96	PL B374 283	R. Wurzinger <i>et al.</i>	(BONN, ORSAY, SACL+)	REFID=44992
PDG	94	PR D50 1173	L. Montanet <i>et al.</i>	(CERN, LBL, BOST+)	REFID=43653
AMSLER	93	ZPHY C58 175	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43311
BELADIDZE	92C	SJNP 55 1535	G.M. Beladidze, S.I. Bityukov, G.V. Borisov	(SERP+)	REFID=43175
		Translated from YAF 55 2748.			
KARCH	92	ZPHY C54 33	K. Karch <i>et al.</i>	(Crystal Ball Collab.)	REFID=42170
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41862
BEHREND	91	ZPHY C49 401	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=41497
AUGUSTIN	90	PR D42 10	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=41352
BARU	90	ZPHY C48 581	S.E. Baru <i>et al.</i>	(MD-1 Collab.)	REFID=41366
BUTLER	90	PR D42 1368	F. Butler <i>et al.</i>	(Mark II Collab.)	REFID=41363
KARCH	90	PL B249 353	K. Karch <i>et al.</i>	(Crystal Ball Collab.)	REFID=41377
ROE	90	PR D41 17	N.A. Roe <i>et al.</i>	(ASP Collab.)	REFID=41014
AIHARA	88C	PR D38 1	H. Aibara <i>et al.</i>	(TPC-2γ Collab.)	REFID=40564
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)	REFID=41023
		Translated from YAF 48 436.			
WILLIAMS	88	PR D38 1365	D.A. Williams <i>et al.</i>	(Crystal Ball Collab.)	REFID=40567
AIHARA	87	PR D35 2650	H. Aibara <i>et al.</i>	(TPC-2γ Collab.)	REFID=40009
ALBRECHT	87B	PL B199 457	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=40265
ALDE	87B	ZPHY C36 603	D.M. Alde <i>et al.</i>	(LANL, BELG, SERP, LAPP)	REFID=40236
ANTREASYAN	87	PR D36 2633	D. Antreasyan <i>et al.</i>	(Crystal Ball Collab.)	REFID=40008
GIDAL	87	PRL 59 2012	G. Gidal <i>et al.</i>	(LBL, SLAC, HARV)	REFID=40223
ALDE	86	PL B177 115	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP)	REFID=20310
BARTEL	85E	PL 160B 421	W. Bartel <i>et al.</i>	(JADE Collab.)	REFID=10843
ALTHOFF	84E	PL 147B 487	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=20305
BERGER	84B	PL 142B 125	C. Berger	(PLUTO Collab.)	REFID=20306
BINON	84	PL 140B 264	F.G. Binon <i>et al.</i>	(SERP, BELG, LAPP+)	REFID=20307
BEHREND	83B	PL 125B 518 (erratum)	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=20302
Also		PL 114B 378	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=20303
JENNI	83	PR D27 1031	P. Jenni <i>et al.</i>	(SLAC, LBL)	REFID=20304
BARTEL	82B	PL 113B 190	W. Bartel <i>et al.</i>	(JADE Collab.)	REFID=20300
DZHELYADIN	81	PL 105B 239	R.I. Dzhelyadin <i>et al.</i>	(SERP)	REFID=10836
STANTON	80	PL B92 353	N.R. Stanton <i>et al.</i>	(OSU, CARL, MCGI+)	REFID=40294
VIKTOROV	80	SJNP 32 520	V.A. Viktorov <i>et al.</i>	(SERP)	REFID=20298
		Translated from YAF 32 1005.			

APEL	79	PL 83B 131	W.D. Apel, K.H. Augenstein, E. Bertolucci (KARLK+)	REFID=20295
BINNIE	79	PL 83B 141	D.M. Binnie <i>et al.</i> (LOIC)	REFID=20296
ZANFINO	77	PRL 38 930	C. Zanfino <i>et al.</i> (CARL, MCGI, OHIO+)	REFID=20293
GRIGORIAN	75	NP B91 232	A. Grigorian <i>et al.</i> (+)	REFID=20287
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman (BNL+)	REFID=20223
DUANE	74	PRL 32 425	A. Duane <i>et al.</i> (LOIC, SHMP)	REFID=20284
KALBFLEISCH	74	PR D10 916	G.R. Kalbfleisch (BNL)	REFID=20286
DANBURG	73	PR D8 3744	J.S. Danburg <i>et al.</i> (BNL, MICH) JP	REFID=20280
JACOBS	73	PR D8 18	S.M. Jacobs <i>et al.</i> (BRAN, UMD, SYRA+) JP	REFID=20281
AGUILAR-...	72B	PR D6 29	M. Aguilar-Benitez <i>et al.</i> (BNL)	REFID=20205
APEL	72	PL 40B 680	W.D. Apel <i>et al.</i> (KARLK, KARLE, PISA)	REFID=20275
DALPIAZ	72	PL 42B 377	P.F. Dalpiaz <i>et al.</i> (CERN)	REFID=20278
BASILE	71	NC 3A 371	M. Basile <i>et al.</i> (CERN, BGNA, STRB)	REFID=20270
HARVEY	71	PRL 27 885	E.H. Harvey <i>et al.</i> (MINN, MICH)	REFID=20272
BENSINGER	70	PL 33B 505	J.R. Bensinger <i>et al.</i> (WISC)	REFID=20268
RITTENBERG	69	Thesis UCRL 18863	A. Rittenberg (LRL) I	REFID=20266
DAVIS	68	PL 27B 532	R. Davis <i>et al.</i> (NWES, ANL)	REFID=20263
LONDON	66	PR 143 1034	G.W. London <i>et al.</i> (BNL, SYRA) IJP	REFID=11774
BADIER	65B	PL 17 337	J. Badier <i>et al.</i> (EPOL, SACL, AMST)	REFID=20253
RITTENBERG	65	PRL 15 556	A. Rittenberg, G.R. Kalbfleisch (LRL, BNL)	REFID=10761
DAUBER	64	PRL 13 449	P.M. Dauber <i>et al.</i> (UCLA) JP	REFID=20247
KALBFLEISCH	64B	PRL 13 349	G.R. Kalbfleisch, O.I. Dahl, A. Rittenberg (LRL) JP	REFID=20252

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f₀(980)I^G(J^{PC}) = 0⁺(0⁺⁺)See also the minireview on scalar mesons under f₀(500). (See the index for the page number.)

NODE=M003

f₀(980) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
990 ±20 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
989.9 ± 0.4	706	ABLIKIM	12E BES3	J/ψ → γ3π	
1003 + 5 - 27		1,2 GARCIA-MAR..11	RVUE	Compilation	
996 ± 7		1,3 GARCIA-MAR..11	RVUE	Compilation	
996 + 4 - 14		4 MOUSSALLAM11	RVUE	Compilation	
981 ± 43		5 MENNESSIER 10	RVUE	Compilation	
1030 + 30 - 10		6 ANISOVICH 09	RVUE	0.0 $\bar{p}p$, πN	
977 + 11 - 9 ± 1	44	7 ECKLUND	09 CLEO	4.17 $e^+ e^- \rightarrow D_s^- D_s^{*+} + c.c.$	
982.2 ± 1.0 ± 8.1		8 UEHARA	08A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	
976.8 ± 0.3 + 10.1 - 0.6	64k	9 AMBROSINO 07	KLOE	1.02 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
984.7 ± 0.4 + 2.4 - 3.7	64k	10 AMBROSINO 07	KLOE	1.02 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	OCCUR=2
973 ± 3	262 ± 30	11 AUBERT	07AKBABR	10.6 $e^+ e^- \rightarrow \phi \pi^+ \pi^- \gamma$	
970 ± 7	54 ± 9	11 AUBERT	07AKBABR	10.6 $e^+ e^- \rightarrow \phi \pi^0 \pi^0 \gamma$	OCCUR=2
953 ± 20	2.6k	12 BONVICINI	07 CLEO	$D^+ \rightarrow \pi^- \pi^+ \pi^+$	
985.6 + 1.2 + 1.1 - 1.5 - 1.6		13 MORI	07 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
983.0 ± 0.6 + 4.0 - 3.0		14 AMBROSINO 06B	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \gamma$	
977.3 ± 0.9 + 3.7 - 4.3		15 AMBROSINO 06B	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \gamma$	OCCUR=2
950 ± 9	4286	16 GARMASH	06 BELL	$B^+ \rightarrow K^+ \pi^+ \pi^-$	
965 ± 10		17 ABLIKIM	05 BES2	$J/\psi \rightarrow \phi \pi^+ \pi^-$, $\phi K^+ K^-$	
1031 ± 8		18 ANISOVICH 03	RVUE		
1037 ± 31		TIKHOMIROV 03	SPEC	$40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	
973 ± 1	2438	19 ALOISIO	02D KLOE	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
977 ± 3 ± 2	848	20 AITALA	01A E791	$D_s^+ \rightarrow \pi^- \pi^+ \pi^+$	
969.8 ± 4.5	419	21 ACHASOV	00H SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
985 + 16 - 12	419	22,23 ACHASOV	00H SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	OCCUR=2
976 ± 5 ± 6		24 AKHMETSHIN 99B	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$	
977 ± 3 ± 6	268	24 AKHMETSHIN 99C	CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	

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975 \pm 4 \pm 6	25 AKHMETSHIN 99C	CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	OCCUR=2
975 \pm 4 \pm 6	26 AKHMETSHIN 99C	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma,$ $\pi^0 \pi^0 \gamma$	OCCUR=3
985 \pm 10	BARBERIS	99 OMEG	$450 pp \rightarrow p_s p_f K^+ K^-$	
982 \pm 3	BARBERIS	99B OMEG	$450 pp \rightarrow p_s p_f \pi^+ \pi^-$	
982 \pm 3	BARBERIS	99C OMEG	$450 pp \rightarrow p_s p_f \pi^0 \pi^0$	
987 \pm 6 \pm 6	27 BARBERIS	99D OMEG	$450 pp \rightarrow K^+ K^-,$ $\pi^+ \pi^-$	
989 \pm 15	BELLAZZINI	99 GAM4	$450 pp \rightarrow pp \pi^0 \pi^0$	
991 \pm 3	28 KAMINSKI	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$	
~ 980	28 OLLER	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
~ 993.5	OLLER	99B RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
~ 987	28 OLLER	99C RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$	
957 \pm 6	29 ACKERSTAFF	98Q OPAL	$Z \rightarrow f_0 X$	
960 \pm 10	ALDE	98 GAM4		
1015 \pm 15	28 ANISOVICH	98B RVUE	Compilation	
1008	30 LOCHER	98 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
955 \pm 10	29 ALDE	97 GAM2	$450 pp \rightarrow pp \pi^0 \pi^0$	
994 \pm 9	31 BERTIN	97C OBLX	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$	
993.2 \pm 6.5 \pm 6.9	32 ISHIDA	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
1006	TORNQVIST	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi,$ $\eta\pi$	
997 \pm 5	33 ALDE	95B GAM2	$38 \pi^- p \rightarrow \pi^0 \pi^0 n$	
960 \pm 10	34 ALDE	95B GAM2	$38 \pi^- p \rightarrow \pi^0 \pi^0 n$	OCCUR=2
994 \pm 5	AMSLER	95B CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0$	
~ 996	35 AMSLER	95D CBAR	$0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0,$ $\pi^0 \eta\eta, \pi^0 \pi^0 \eta$	
987 \pm 6	36 ANISOVICH	95 RVUE		
1015	JANSSEN	95 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
983	37 BUGG	94 RVUE	$\bar{p}p \rightarrow \eta 2\pi^0$	
973 \pm 2	38 KAMINSKI	94 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
988	39 ZOU	94B RVUE		
988 \pm 10	40 MORGAN	93 RVUE	$\pi\pi(K\bar{K}) \rightarrow \pi\pi(K\bar{K}),$ $J/\psi \rightarrow \phi\pi\pi(K\bar{K}),$ $D_s \rightarrow \pi(\pi\pi)$	
971.1 \pm 4.0	29 AGUILAR-...	91 EHS	$400 pp$	
979 \pm 4	41 ARMSTRONG	91 OMEG	$300 pp \rightarrow pp\pi\pi,$ $ppK\bar{K}$	
956 \pm 12	BREAKSTONE	90 SFM	$pp \rightarrow pp\pi^+\pi^-$	
959.4 \pm 6.5	29 AUGUSTIN	89 DM2	$J/\psi \rightarrow \omega\pi^+\pi^-$	
978 \pm 9	29 ABACHI	86B HRS	$e^+ e^- \rightarrow \pi^+ \pi^- X$	
985.0 \pm 9.0	ETKIN	82B MPS	$23 \pi^- p \rightarrow n 2K_S^0$	
974 \pm 4	41 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+ \pi^- X$	
975	42 ACHASOV	80 RVUE		
986 \pm 10	41 AGUILAR-...	78 HBC	$0.7 \bar{p}p \rightarrow K_S^0 K_S^0$	
969 \pm 5	41 LEEPER	77 ASPK	$2-2.4 \pi^- p \rightarrow$ $\pi^+ \pi^- n, K^+ K^- n$	
987 \pm 7	41 BINNIE	73 CNTR	$\pi^- p \rightarrow n MM$	
1012 \pm 6	43 GRAYER	73 ASPK	$17 \pi^- p \rightarrow \pi^+ \pi^- n$	
1007 \pm 20	43 HYAMS	73 ASPK	$17 \pi^- p \rightarrow \pi^+ \pi^- n$	
997 \pm 6	43 PROTOPOP...	73 HBC	$7 \pi^+ p \rightarrow \pi^+ p \pi^+ \pi^-$	

1 Quoted number refers to real part of pole position.

2 Analytic continuation using Roy equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPOV 73.

3 Analytic continuation using GKPY equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPOV 73.

4 Pole position. Used Roy equations.

5 Average of the analyses of three data sets in the K-matrix model. Uses the data of BATLEY 08A, HYAMS 73, and GRAYER 74, partially of COHEN 80 or ETKIN 82B.

6 On sheet II in a 2-pole solution. The other pole is found on sheet III at $(850-100)$ MeV

7 Using a relativistic Breit-Wigner function and taking into account the finite D_s mass.

8 Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0} K K / g_{f_0} \pi\pi = 0$.

9 In the kaon-loop fit.

10 In the no-structure fit.

11 Systematic errors not estimated.

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- 12 FLATTE 76 parameterization. $g_{f_0\pi\pi} = 329 \pm 96 \text{ MeV}/c^2$ assuming $g_{f_0K\bar{K}}/g_{f_0\pi\pi} = 2$.
- 13 Breit-Wigner mass. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0K\bar{K}}/g_{f_0\pi\pi} = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.
- 14 In the kaon-loop fit following formalism of ACHASOV 89.
- 15 In the no-structure fit assuming a direct coupling of ϕ to $f_0\gamma$.
- 16 FLATTE 76 parameterization. Supersedes GARMASH 05.
- 17 FLATTE 76 parameterization, $g_{f_0K\bar{K}}/g_{f_0\pi\pi} = 4.21 \pm 0.25 \pm 0.21$.
- 18 K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K\bar{K}n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.
- 19 From the negative interference with the $f_0(500)$ meson of AITALA 01B using the ACHASOV 89 parameterization for the $f_0(980)$, a Breit-Wigner for the $f_0(500)$, and ACHASOV 01F for the $\rho\pi$ contribution.
- 20 Coupled-channel Breit-Wigner, couplings $g_\pi = 0.09 \pm 0.01 \pm 0.01$, $g_K = 0.02 \pm 0.04 \pm 0.03$.
- 21 Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- 22 Supersedes ACHASOV 98I.
- 23 In the "narrow resonance" approximation.
- 24 Assuming $\Gamma(f_0) = 40 \text{ MeV}$.
- 25 From a narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
- 26 From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.
- 27 Supersedes BARBERIS 99 and BARBERIS 99B
- 28 T-matrix pole.
- 29 From invariant mass fit.
- 30 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(1039 - 93i) \text{ MeV}$.
- 31 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(963 - 29i) \text{ MeV}$.
- 32 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- 33 At high $|t|$.
- 34 At low $|t|$.
- 35 On sheet II in a 4-pole solution, the other poles are found on sheet III at $(953 - 55i) \text{ MeV}$ and on sheet IV at $(938 - 35i) \text{ MeV}$.
- 36 Combined fit of ALDE 95B, ANISOVICH 94, AMSLER 94D.
- 37 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(996 - 103i) \text{ MeV}$.
- 38 From sheet II pole position.
- 39 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(797 - 185i) \text{ MeV}$ and can be interpreted as a shadow pole.
- 40 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(978 - 28i) \text{ MeV}$.
- 41 From coupled channel analysis.
- 42 Coupled channel analysis with finite width corrections.
- 43 Included in AGUILAR-BENITEZ 78 fit.

$f_0(980)$ WIDTH

Width determination very model dependent. Peak width in $\pi\pi$ is about 50 MeV, but decay width can be much larger.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
40 to 100 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9.5 ± 1.1	706	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma 3\pi$
42 + 20 - 16		1,2 GARCIA-MAR..11	RVUE	Compilation
50 + 20 - 12		2,3 GARCIA-MAR..11	RVUE	Compilation
48 + 22 - 6		4 MOUSSALLAM11	RVUE	Compilation
36 ± 22		5 MENNESSIER 10	RVUE	Compilation
70 + 20 - 32		6 ANISOVICH 09	RVUE	0.0 $\bar{p}p$, πN
91 + 30 - 22 ± 3	44	7 ECKLUND	09 CLEO	$4.17 e^+ e^- \rightarrow D_s^- D_s^{*+} + c.c.$
66.9 ± 2.2 + 17.6 - 12.5		8 UEHARA	08A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
65 ± 13	262 ± 30	9 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \phi \pi^+ \pi^- \gamma$

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81 ± 21	54 ± 9	9 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \phi \pi^0 \pi^0 \gamma$	OCCUR=2
$51.3^{+20.8}_{-17.7} {}^{+13.2}_{-3.8}$		10 MORI	07 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
$61 \pm 9 {}^{+14}_{-8}$	2584	11 GARMASH	05 BELL	$B^+ \rightarrow K^+ \pi^+ \pi^-$	
64 ± 16		12 ANISOVICH	03 RVUE		
121 ± 23		TIKHOMIROV	03 SPEC	$40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	
~ 70		13 BRAMON	02 RVUE	$1.02 e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
$44 \pm 2 \pm 2$	848	14 AITALA	01A E791	$D_s^+ \rightarrow \pi^- \pi^+ \pi^+$	
201 ± 28	419	15 ACHASOV	00H SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
122 ± 13	419	16,17 ACHASOV	00H SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	OCCUR=2
56 ± 20		18 AKHMETSHIN	99C CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
65 ± 20		BARBERIS	99 OMEG	$450 pp \rightarrow p_s p_f K^+ K^-$	
80 ± 10		BARBERIS	99B OMEG	$450 pp \rightarrow p_s p_f \pi^+ \pi^-$	
80 ± 10		BARBERIS	99C OMEG	$450 pp \rightarrow p_s p_f \pi^0 \pi^0$	
$48 \pm 12 \pm 8$		19 BARBERIS	99D OMEG	$450 pp \rightarrow K^+ K^-, \pi^+ \pi^-$	
65 ± 25		BELLAZZINI	99 GAM4	$450 pp \rightarrow pp \pi^0 \pi^0$	
71 ± 14		20 KAMINSKI	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$	
~ 28		20 OLLER	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
~ 25		OLLER	99B RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
~ 14		20 OLLER	99C RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$	
70 ± 20		ALDE	98 GAM4		
86 ± 16		20 ANISOVICH	98B RVUE	Compilation	
54		21 LOCHER	98 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
69 ± 15		22 ALDE	97 GAM2	$450 pp \rightarrow pp \pi^0 \pi^0$	
38 ± 20		23 BERTIN	97C OBLX	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$	
~ 100		24 ISHIDA	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
34		TORNQVIST	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$	
48 ± 10	3k	25 ALDE	95B GAM2	$38 \pi^- p \rightarrow \pi^0 \pi^0 n$	
95 ± 20	10k	26 ALDE	95B GAM2	$38 \pi^- p \rightarrow \pi^0 \pi^0 n$	OCCUR=2
26 ± 10		AMSLER	95B CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0$	
~ 112		27 AMSLER	95D CBAR	$0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta\eta, \pi^0 \pi^0 \eta$	
80 ± 12		28 ANISOVICH	95 RVUE		
30		JANSSEN	95 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
74		29 BUGG	94 RVUE	$\bar{p}p \rightarrow \eta 2\pi^0$	
29 ± 2		30 KAMINSKI	94 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$	
46		31 ZOU	94B RVUE		
48 ± 12		32 MORGAN	93 RVUE	$\pi\pi(K\bar{K}) \rightarrow \pi\pi(K\bar{K}), J/\psi \rightarrow \phi\pi\pi(K\bar{K}), D_s \rightarrow \pi(\pi\pi)$	
37.4 ± 10.6		22 AGUILAR-...	91 EHS	$400 pp$	
72 ± 8		33 ARMSTRONG	91 OMEG	$300 pp \rightarrow pp\pi\pi, ppK\bar{K}$	
110 ± 30		BREAKSTONE	90 SFM	$pp \rightarrow pp\pi^+\pi^-$	
29 ± 13		22 ABACHI	86B HRS	$e^+ e^- \rightarrow \pi^+\pi^- X$	
$120 \pm 281 \pm 20$		ETKIN	82B MPS	$23 \pi^- p \rightarrow n2K_S^0$	
28 ± 10		33 GIDAL	81 MRK2	$J/\psi \rightarrow \pi^+\pi^- X$	
$70 \text{ to } 300$		34 ACHASOV	80 RVUE		
100 ± 80		35 AGUILAR-...	78 HBC	$0.7 \bar{p}p \rightarrow K_S^0 K_S^0$	
30 ± 8		33 LEEPER	77 ASPK	$2-2.4 \pi^- p \rightarrow \pi^+\pi^- n, K^+ K^- n$	
48 ± 14		33 BINNIE	73 CNTR	$\pi^- p \rightarrow nMM$	
32 ± 10		36 GRAYER	73 ASPK	$17 \pi^- p \rightarrow \pi^+\pi^- n$	
30 ± 10		36 HYAMS	73 ASPK	$17 \pi^- p \rightarrow \pi^+\pi^- n$	
54 ± 16		36 PROTOPOP...	73 HBC	$7 \pi^+ p \rightarrow \pi^+ p\pi^+\pi^-$	

- 1 Analytic continuation using Roy equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.
- 2 Quoted number refers to twice imaginary part of pole position.
- 3 Analytic continuation using GKPY equations. Uses the K_{e4} data of BATLEY 10C and the $\pi N \rightarrow \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73.
- 4 Pole position. Used Roy equations.
- 5 Average of the analyses of three data sets in the K-matrix model. Uses the data of BATLEY 08A, HYAMS 73, and GRAYER 74, partially of COHEN 80 or ETKIN 82B.
- 6 On sheet II in a 2-pole solution. The other pole is found on sheet III at $(850 - 100i)$ MeV
- 7 Using a relativistic Breit-Wigner function and taking into account the finite D_S mass.
- 8 Breit-Wigner $\pi\pi$ width. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $gf_0 KK/gf_0 \pi\pi = 0$.
- 9 Systematic errors not estimated.
- 10 Breit-Wigner $\pi\pi$ width. Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $gf_0 KK/gf_0 \pi\pi = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.
- 11 Breit-Wigner, solution 1, PWA ambiguous.
- 12 K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K\bar{K} n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta\eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.
- 13 Using the data of AKHMETSHIN 99C, ACHASOV 00H, and ALOISIO 02D.
- 14 Breit-Wigner width.
- 15 Supersedes ACHASOV 98I. Using the model of ACHASOV 89.
- 16 Supersedes ACHASOV 98I.
- 17 In the "narrow resonance" approximation.
- 18 From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.
- 19 Supersedes BARBERIS 99 and BARBERIS 99B
- 20 T-matrix pole.
- 21 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(1039 - 93i)$ MeV.
- 22 From invariant mass fit.
- 23 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(963 - 29i)$ MeV.
- 24 Reanalysis of data from HYAMS 73, GRAYER 74, SRINIVASAN 75, and ROSSELET 77 using the interfering amplitude method.
- 25 At high $|t|$.
- 26 At low $|t|$.
- 27 On sheet II in a 4-pole solution, the other poles are found on sheet III at $(953 - 55i)$ MeV and on sheet IV at $(938 - 35i)$ MeV.
- 28 Combined fit of ALDE 95B, ANISOVICH 94,
- 29 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(996 - 103i)$ MeV.
- 30 From sheet II pole position.
- 31 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(797 - 185i)$ MeV and can be interpreted as a shadow pole.
- 32 On sheet II in a 2 pole solution. The other pole is found on sheet III at $(978 - 28i)$ MeV.
- 33 From coupled channel analysis.
- 34 Coupled channel analysis with finite width corrections.
- 35 From coupled channel fit to the HYAMS 73 and PROTOPOPESCU 73 data. With a simultaneous fit to the $\pi\pi$ phase-shifts, inelasticity and to the $K_S^0 K_S^0$ invariant mass.
- 36 Included in AGUILAR-BENITEZ 78 fit.

$f_0(980)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	dominant
$\Gamma_2 K\bar{K}$	seen
$\Gamma_3 \gamma\gamma$	seen
$\Gamma_4 e^+ e^-$	

$f_0(980)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$	DOCUMENT ID	TECN	COMMENT	Γ_3
VALUE (keV)				
0.29 ± 0.07 OUR AVERAGE				
0.286 ± 0.017 -0.070	1 UEHARA	08A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	
0.205 ± 0.095 -0.083 $+0.147$ -0.117	2 MORI	07 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
0.28 ± 0.09 -0.13	3 BOGLIONE	99 RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^-$, $\pi^0 \pi^0$	
0.42 ± 0.06 ± 0.18	4 OEST	90 JADE	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	

NODE=M003W1;LINKAGE=GC

NODE=M003W1;LINKAGE=GI

NODE=M003W1;LINKAGE=GM

NODE=M003W1;LINKAGE=MU

NODE=M003W1;LINKAGE=ME

NODE=M003W1;LINKAGE=AO

NODE=M003W1;LINKAGE=EC

NODE=M003W1;LINKAGE=UE

NODE=M003W1;LINKAGE=NS

NODE=M003W1;LINKAGE=MO

NODE=M003W1;LINKAGE=GA

NODE=M003W;LINKAGE=KM

NODE=M003W;LINKAGE=BR

NODE=M003W;LINKAGE=TL

NODE=M003W;LINKAGE=V9

NODE=M003W;LINKAGE=V8

NODE=M003W1;LINKAGE=AI

NODE=M003W;LINKAGE=SL

NODE=M003W1;LINKAGE=BD

NODE=M003W1;LINKAGE=AN

NODE=M003W1;LINKAGE=LO

NODE=M003W1;LINKAGE=A

NODE=M003W1;LINKAGE=X

NODE=M003W1;LINKAGE=AA

NODE=M003W1;LINKAGE=LA

NODE=M003W1;LINKAGE=LB

NODE=M003W1;LINKAGE=KL

NODE=M003W1;LINKAGE=CF

NODE=M003W1;LINKAGE=C2

NODE=M003W1;LINKAGE=KM

NODE=M003W1;LINKAGE=L

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NODE=M003W1;LINKAGE=B

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NODE=M003W;LINKAGE=C

NODE=M003W;LINKAGE=R

NODE=M003215;NODE=M003

DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow DESIG=1;OUR EVAL; \rightarrow UNCHECKED \leftarrow DESIG=5;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=4

NODE=M003220

NODE=M003W4

NODE=M003W4

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.16 ± 0.01	5	MENNESSIER 11	RVUE	
0.29 ± 0.21	+0.02 -0.07	6 MOUSSALLAM11	RVUE	Compilation
0.42	7,8 PENNINGTON 08	RVUE	Compilation	
0.10	8,9 PENNINGTON 08	RVUE	Compilation	
0.29 ± 0.07 ± 0.12	10,11 BOYER 90	MRK2	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
0.31 ± 0.14 ± 0.09	10,11 MARSISKE 90	CBAL	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	
0.63 ± 0.14	12 MORGAN 90	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	

1 Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0} K K / g_{f_0} \pi \pi = 0$.

2 Using finite width corrections according to FLATTE 76 and ACHASOV 05, and the ratio $g_{f_0} K K / g_{f_0} \pi \pi = 4.21 \pm 0.25 \pm 0.21$ from ABLIKIM 05.

3 Supersedes MORGAN 90.

4 OEST 90 quote systematic errors ± 0.08 . We use ± 0.18 . Observed 60 events.

5 Uses an analytic K-matrix model. Compilation.

6 Using dispersion integral with phase input from Roy equations and data from MARSISKE 90, BOYER 90, BEHREND 92, UEHARA 08A, and MORI 07.

7 Solution A (preferred solution based on χ^2 -analysis).

8 Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.

9 Solution B (worse than solution A; still acceptable when systematic uncertainties are included).

10 From analysis allowing arbitrary background unconstrained by unitarity.

11 Data included in MORGAN 90, BOGLIONE 99 analyses.

12 From amplitude analysis of BOYER 90 and MARSISKE 90, data corresponds to resonance parameters $m = 989$ MeV, $\Gamma = 61$ MeV.

OCCUR=2

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NODE=M003W4;LINKAGE=BL

NODE=M003W4;LINKAGE=H

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NODE=M003W4;LINKAGE=P2

NODE=M003W4;LINKAGE=B

NODE=M003W4;LINKAGE=C

NODE=M003W4;LINKAGE=A

$\Gamma(e^+ e^-)$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_4
<8.4	90	VOROBYEV	88	ND	$e^+ e^- \rightarrow \pi^0 \pi^0$

$f_0(980)$ BRANCHING RATIOS

$\Gamma(\pi\pi)/[\Gamma(\pi\pi) + \Gamma(K\bar{K})]$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_1/(\Gamma_1+\Gamma_2)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.52 ± 0.12	9.9k	1 AUBERT	060 BABR	$B^\pm \rightarrow K^\pm \pi^\pm \pi^\mp$
0.75 ± 0.11		2 ABLIKIM	05Q BES2	$\chi_{c0} \rightarrow 2\pi^+ 2\pi^-$, $\pi^+ \pi^- K^+ K^-$
0.84 ± 0.02		3 ANISOVICH	02D SPEC	Combined fit
~0.68		OLLER	99B RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
0.67 ± 0.09		4 LOVERRE	80 HBC	$4\pi^- p \rightarrow n2K_S^0$
0.81 ± 0.09		4 CASON	78 STRC	$7\pi^- p \rightarrow n2K_S^0$
0.78 ± 0.03		4 WETZEL	76 OSPK	$8.9\pi^- p \rightarrow n2K_S^0$

1 Recalculated by us using $\Gamma(K^+ K^-) / \Gamma(\pi^+ \pi^-) = 0.69 \pm 0.32$ from AUBERT 060 and isospin relations.

2 Using data from ABLIKIM 04G.

3 From a combined K-matrix analysis of Crystal Barrel (0. $p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$), GAMS ($\pi p \rightarrow \pi^0 \pi^0 n$, $\eta \eta n$, $\eta \eta' n$), and BNL ($\pi p \rightarrow K\bar{K} n$) data.

4 Measure $\pi\pi$ elasticity assuming two resonances coupled to the $\pi\pi$ and $K\bar{K}$ channels only.

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NODE=M003R1

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NODE=M003R1;LINKAGE=AB

NODE=M003R;LINKAGE=CH

NODE=M003R1;LINKAGE=B

$f_0(980)$ REFERENCES

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GARCIA-MAR... ₁₁	11	PRL 107 072001	R. Garcia-Martin <i>et al.</i>	(MADR, CRAC)
MENNESSIER	11	PL B696 40	G. Mennessier, S. Narison, X.-G. Wang	
MOUSSALLAM	11	EPJ C71 1814	B. Moussallam	
BATLEY	10C	EPJ C70 635	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
MENNESSIER	10	PL B688 59	G. Mennessier, S. Narison, X.-G. Wang	
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
ECKLUND	09	PR D80 052009	K.M. Ecklund <i>et al.</i>	(CLEO Collab.)
BATLEY	08A	EPJ C54 411	J.R. Batley <i>et al.</i>	(CERN NA48/2 Collab.)
PENNINGTON	08	EPJ C56 1	M.R. Pennington <i>et al.</i>	
UEHARA	08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)
AMBROSINO	07	EPJ C49 473	F. Ambrosino <i>et al.</i>	(KLOE Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
BONVICINI	07	PR D76 012001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
MORI	07	PR D75 051101	T. Mori <i>et al.</i>	(BELLE Collab.)
AMBROSINO	06B	PL B634 148	F. Ambrosino <i>et al.</i>	(KLOE Collab.)
AUBERT	06O	PR D74 032003	B. Aubert <i>et al.</i>	(BABAR Collab.)

NODE=M003

REFID=54270

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REFID=51616

REFID=51908

REFID=51721

REFID=51652

REFID=51043

REFID=51141

GARMASH	06	PRL 96 251803	A. Garmash <i>et al.</i>	(BELLE Collab.)	REFID=51162
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50450
ABLIKIM	05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50958
ACHASOV	05	PR D72 013006	N.N. Achasov, G.N. Shestakov		REFID=50762
GARMASH	05	PR D71 092003	A. Garmash <i>et al.</i>	(BELLE Collab.)	REFID=50641
ABLIKIM	04G	PR D70 092002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50187
ANISOVICH	03	EPJ A16 229	V.V. Anisovich <i>et al.</i>		REFID=49401
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>		REFID=49423
		Translated from YAF 66 860.			
ALOISIO	02D	PL B537 21	A. Aloisio <i>et al.</i>	(KLOE Collab.)	REFID=48824
ANISOVICH	02D	PAN 65 1545	V.V. Anisovich <i>et al.</i>		REFID=48831
		Translated from YAF 65 1583.			
BRAMON	02	EPJ C26 253	A. Bramon <i>et al.</i>		REFID=49178
ACHASOV	01F	PR D63 094007	N.N. Achasov, V.V. Gubin	(Novosibirsk SND Collab.)	REFID=48312
AITALA	01A	PRL 86 765	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)	REFID=48004
AITALA	01B	PRL 86 770	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)	REFID=48005
ACHASOV	00H	PL B485 349	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47930
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=47392
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	REFID=47393
BARBERIS	99	PL B453 305	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46921
BARBERIS	99B	PL B453 316	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46922
BARBERIS	99C	PL B453 325	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46923
BARBERIS	99D	PL B462 462	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=47395
BELLAZZINI	99	PL B467 296	R. Bellazzini <i>et al.</i>		REFID=47400
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington		REFID=46931
KAMINSKI	99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN)	REFID=46927
OLLER	99	PR D60 099906 (erratum)	J.A. Oller <i>et al.</i>		REFID=46899
OLLER	99B	NP A652 407 (erratum)	J.A. Oller, E. Oset		REFID=46924
OLLER	99C	PR D60 074023	J.A. Oller, E. Oset		REFID=47386
ACHASOV	98I	PL B440 442	M.N. Achasov <i>et al.</i>		REFID=46600
ACKERSTAFF	98Q	EPJ C4 19	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)	REFID=46145
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)	REFID=46605
Also		PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)	REFID=46914
		Translated from YAF 62 446.			
ANISOVICH	98B	SPU 41 419	V.V. Anisovich <i>et al.</i>		REFID=46331
		Translated from UFN 168 481.			
LOCHER	98	EPJ C4 317	M.P. Locher <i>et al.</i>	(PSI)	REFID=46372
ALDE	97	PL B397 350	D.M. Alde <i>et al.</i>	(GAMS Collab.)	REFID=45392
BERTIN	97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45701
ISHIDA	96	PTP 95 745	S. Ishida <i>et al.</i>	(TOKY, MIYA, KEK)	REFID=45770
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)	REFID=44507
ALDE	95B	ZPHY C66 375	D.M. Alde <i>et al.</i>	(GAMS Collab.)	REFID=44375
AMSLER	95B	PL B342 433	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44377
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ANISOVICH	95	PL B355 363	V.V. Anisovich <i>et al.</i>	(PNPI, SERP)	REFID=44442
JANSSEN	95	PR D52 2690	G. Janssen <i>et al.</i>	(STON, ADLD, JULI)	REFID=44508
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ANISOVICH	94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43659
BUGG	94	PR D50 4412	D.V. Bugg <i>et al.</i>	(LOQM)	REFID=44078
KAMINSKI	94	PR D50 3145	R. Kaminski, L. Lesniak, J.P. Maillet	(CRAC+)	REFID=45771
ZOU	94B	PR D50 591	B.S. Zou, D.V. Bugg	(LOQM)	REFID=44072
MORGAN	93	PR D48 1185	D. Morgan, M.R. Pennington	(RAL, DURH)	REFID=43614
BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.)	REFID=43172
AGUILAR-...	91	ZPHY C50 405	M. Aguilar-Benitez <i>et al.</i>	(LEBC-EHS Collab.)	REFID=41637
ARMSTRONG	91	ZPHY C51 351	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41744
BOYER	90	PR D42 1350	J. Boyer <i>et al.</i>	(Mark II Collab.)	REFID=41362
BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone <i>et al.</i>	(ISU, BGNA, CERN+)	REFID=41376
MARSISKE	90	PR D41 3324	H. Marsiske <i>et al.</i>	(Crystal Ball Collab.)	REFID=41351
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)	REFID=41583
OEST	90	ZPHY C47 343	T. Oest <i>et al.</i>	(JADE Collab.)	REFID=41358
ACHASOV	89	NP B315 465	N.N. Achasov, V.N. Ivanchenko		REFID=48021
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41004
VOROB'YEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)	REFID=41023
		Translated from YAF 48 436.			
ABACHI	86B	PRL 57 1990	S. Abachi <i>et al.</i>	(PURD, ANL, IND, MICH+)	REFID=20394
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)	REFID=20390
GIDAL	81	PL 107B 153	G. Gidal <i>et al.</i>	(SLAC, LBL)	REFID=20386
ACHASOV	80	SJNP 32 566	N.N. Achasov, S.A. Devyanin, G.N. Shestakov	(NOVM)	REFID=20458
		Translated from YAF 32 1098.			
COHEN	80	PR D22 2595	D. Cohen <i>et al.</i>	(ANL) IJP	REFID=20381
LOVERRE	80	ZPHY C6 187	P.F. Loverre <i>et al.</i>	(CERN, CDEF, MADR+) IJP	REFID=20382
AGUILAR-...	78	NP B140 73	M. Aguilar-Benitez <i>et al.</i>	(MADR, BOMB+)	REFID=20368
CASON	78	PRL 41 271	N.M. Cason <i>et al.</i>	(NDAM, ANL)	REFID=20370
LEEPER	77	PR D16 2054	R.J. Leeper <i>et al.</i>	(ISU)	REFID=20365
ROSSELET	77	PR D15 574	L. Rosselet <i>et al.</i>	(GEVA, SACL)	REFID=11004
FLATTE	76	PL 63B 224	S.M. Flatté	(CERN)	REFID=20446
WETZEL	76	NP B115 208	W. Wetzel <i>et al.</i>	(ETH, CERN, LOIC)	REFID=20362
SRINIVASAN	75	PR D12 681	V. Srinivasan <i>et al.</i>	(NDAM, ANL)	REFID=21062
GRAYER	74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM)	REFID=20113
BINNIE	73	PRL 31 1534	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)	REFID=20343
GRAYER	73	Tallahassee	G. Grayer <i>et al.</i>	(CERN, MPIM)	REFID=20347
HYAMS	73	NP B64 134	B.D. Hyams <i>et al.</i>	(CERN, MPIM)	REFID=20107
PROTOPOP...	73	PR D7 1279	S.D. Protopopescu <i>et al.</i>	(LBL)	REFID=20108

$a_0(980)$ $I^G(J^{PC}) = 1^-(0^{++})$

See our minireview on scalar mesons under $f_0(500)$. (See the index for the page number.)

 $a_0(980)$ MASSVALUE (MeV)DOCUMENT ID **980 ± 20 OUR ESTIMATE** Mass determination very model dependent **$\eta\pi$ FINAL STATE ONLY**

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •					
982.5 \pm 1.6 \pm 1.1	16.9k	¹ AMBROSINO	09F	KLOE	$1.02 e^+ e^- \rightarrow \eta\pi^0\gamma$
986 \pm 4		ANISOVICH	09	RVUE	$0.0 \bar{p}p, \pi N$
982.3 \pm 0.6 \pm 3.1		² UEHARA	09A	BELL	$\gamma\gamma \rightarrow \pi^0\eta$
987.4 \pm 1.0 \pm 3.0		^{3,4} BUGG	08A	RVUE 0	$\bar{p}p \rightarrow \pi^0\pi^0\eta$
989.1 \pm 1.0 \pm 3.0		^{4,5} BUGG	08A	RVUE 0	$\bar{p}p \rightarrow \pi^0\pi^0\eta$
985 \pm 4 \pm 6	318	ACHARD	02B	L3	$183-209 e^+ e^- \rightarrow e^+ e^- \eta\pi^+\pi^-$
995 \pm 52 -10	36	⁶ ACHASOV	00F	SND	$e^+ e^- \rightarrow \eta\pi^0\gamma$
994 \pm 33 -8	36	⁷ ACHASOV	00F	SND	$e^+ e^- \rightarrow \eta\pi^0\gamma$
975 \pm 7		BARBERIS	00H		$450 pp \rightarrow p_f \eta\pi^0 p_s$
988 \pm 8		BARBERIS	00H		$450 pp \rightarrow \Delta_f^{++} \eta\pi^- p_s$
~ 1055		⁸ OLLER	99	RVUE	$\eta\pi, K\bar{K}$
~ 1009.2		⁸ OLLER	99B	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
993.1 \pm 2.1		⁹ TEIGE	99	B852	$18.3 \pi^- p \rightarrow \eta\pi^+\pi^- n$
988 \pm 6		⁸ ANISOVICH	98B	RVUE	Compilation
987		TORNQVIST	96	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
991		JANSSEN	95	RVUE	$\eta\pi \rightarrow \eta\pi, K\bar{K}, K\pi, \eta\pi$
984.45 \pm 1.23 \pm 0.34		AMSLER	94C	CBAR	$0.0 \bar{p}p \rightarrow \omega\eta\pi^0$
982 \pm 2		¹⁰ AMSLER	92	CBAR	$0.0 \bar{p}p \rightarrow \eta\eta\pi^0$
984 \pm 4	1040	¹⁰ ARMSTRONG	91B	OMEG \pm	$300 pp \rightarrow pp\eta\pi^+\pi^-$
976 \pm 6		ATKINSON	84E	OMEG \pm	$25-55 \gamma p \rightarrow \eta\pi n$
986 \pm 3	500	¹¹ EVANGELIS...	81	OMEG \pm	$12 \pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
990 \pm 7	145	¹¹ GURTU	79	HBC \pm	$4.2 K^- p \rightarrow \Lambda\eta 2\pi$
980 \pm 11	47	CONFORTO	78	OSPK $-$	$4.5 \pi^- p \rightarrow pX^-$
978 \pm 16	50	CORDEN	78	OMEG \pm	$12-15 \pi^- p \rightarrow n\eta 2\pi$
977 \pm 7		GRASSLER	77	HBC $-$	$16 \pi^\mp p \rightarrow p\eta 3\pi$
989 \pm 4	70	WELLS	75	HBC $-$	$3.1-6 K^- p \rightarrow \Lambda\eta 2\pi$
972 \pm 10	150	DEFOIX	72	HBC \pm	$0.7 \bar{p}p \rightarrow 7\pi$
970 \pm 15	20	BARNES	69C	HBC $-$	$4-5 K^- p \rightarrow \Lambda\eta 2\pi$
980 \pm 10		CAMPBELL	69	DBC \pm	$2.7 \pi^+ d$
980 \pm 10	15	MILLER	69B	HBC $-$	$4.5 K^- N \rightarrow \eta\pi\Lambda$
980 \pm 10	30	AMMAR	68	HBC \pm	$5.5 K^- p \rightarrow \Lambda\eta 2\pi$

1 Using the model of ACHASOV 89 and ACHASOV 03B.

2 From a fit with the S-wave amplitude including two interfering Breit-Wigners plus a background term.

3 Parameterizes couplings to $\bar{K}K$, $\pi\eta$, and $\pi\eta'$.

4 Using AMSLER 94D and ABELE 98.

5 From the T-matrix pole on sheet II.

6 Using the model of ACHASOV 89. Supersedes ACHASOV 98B.

7 Using the model of JAFFE 77. Supersedes ACHASOV 98B.

8 T-matrix pole.

9 Breit-Wigner fit, average between a_0^\pm and a_0^0 . The fit favors a slightly heavier a_0^\pm .

10 From a single Breit-Wigner fit.

11 From $f_1(1285)$ decay.

NODE=M036

NODE=M036

NODE=M036205

NODE=M036MX

→ UNCHECKED ←

NODE=M036M1

NODE=M036M1

OCCUR=2

OCCUR=2

OCCUR=2

OCCUR=2

NODE=M036M1;LINKAGE=AM

NODE=M036M1;LINKAGE=UE

NODE=M036M1;LINKAGE=BP

NODE=M036M1;LINKAGE=BU

NODE=M036M1;LINKAGE=BT

NODE=M036M1;LINKAGE=V1

NODE=M036M1;LINKAGE=M2

NODE=M036M1;LINKAGE=AN

NODE=M036M1;LINKAGE=BF

NODE=M036M1;LINKAGE=A

NODE=M036M1;LINKAGE=R

$K\bar{K}$ ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~1053	12	OLLER	99C	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
982 \pm 3	13	ABELE	98	CBAR	$0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
975 \pm 15		BERTIN	98B	OBLX	$0.0 \bar{p}p \rightarrow K^\pm K_s \pi^\mp$
976 \pm 6	316	DEBILLY	80	HBC	$1.2-2 \bar{p}p \rightarrow f_1(1285)\omega$
1016 \pm 10	100	14 ASTIER	67	HBC	$0.0 \bar{p}p$
1003.3 \pm 7.0	143	15 ROSENFELD	65	RVUE	\pm

12 T-matrix pole.

13 T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.

14 ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.

15 Plus systematic errors.

NODE=M036M2

NODE=M036M2

 $a_0(980)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
50 to 100 OUR ESTIMATE					Width determination very model dependent. Peak width in $\eta\pi$ is about 60 MeV, but decay width can be much larger.

• • • We do not use the following data for averages, fits, limits, etc. • • •

75.6 \pm 1.6 $^{+17.4}_{-10.0}$	16	UEHARA	09A	BELL	$\gamma\gamma \rightarrow \pi^0 \eta$
80.2 \pm 3.8 \pm 5.4	17	BUGG	08A	RVUE	$0 \bar{p}p \rightarrow \pi^0 \pi^0 \eta$
50 \pm 13 \pm 4	318	ACHARD	02B	L3	$183-209 e^+ e^- \rightarrow e^+ e^- \eta\pi^+ \pi^-$
72 \pm 16		BARBERIS	00H		$450 pp \rightarrow p_f \eta\pi^0 p_s$
61 \pm 19		BARBERIS	00H		$450 pp \rightarrow \Delta_f^{++} \eta\pi^- p_s$
~42	18	OLLER	99	RVUE	$\eta\pi, K\bar{K}$
~112	18	OLLER	99B	RVUE	$\pi\pi \rightarrow \eta\pi, K\bar{K}$
71 \pm 7		TEIGE	99	B852	$18.3 \pi^- p \rightarrow \eta\pi^+ \pi^- n$
92 \pm 20	18	ANISOVICH	98B	RVUE	Compilation
65 \pm 10	19	BERTIN	98B	OBLX	$0.0 \bar{p}p \rightarrow K^\pm K_s \pi^\mp$
~100		TORNQVIST	96	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
202		JANSSEN	95	RVUE	$\eta\pi \rightarrow \eta\pi, K\bar{K}, K\pi, \eta\pi$
54.12 \pm 0.34 \pm 0.12		AMSLER	94C	CBAR	$0.0 \bar{p}p \rightarrow \omega\eta\pi^0$
54 \pm 10	20	AMSLER	92	CBAR	$0.0 \bar{p}p \rightarrow \eta\eta\pi^0$
95 \pm 14	1040	20 ARMSTRONG	91B	OMEG	$300 pp \rightarrow pp\eta\pi^+ \pi^-$
62 \pm 15	500	21 EVANGELIS...	81	OMEG	$12 \pi^- p \rightarrow \eta\pi^+ \pi^- \pi^- p$
60 \pm 20	145	21 GURTU	79	HBC	$4.2 K^- p \rightarrow \Lambda\eta 2\pi$
60 $^{+50}_{-30}$	47	CONFORTO	78	OSPK	$4.5 \pi^- p \rightarrow p X^-$
86.0 $^{+60.0}_{-50.0}$	50	CORDEN	78	OMEG	$12-15 \pi^- p \rightarrow n\eta 2\pi$
44 \pm 22		GRASSLER	77	HBC	$16 \pi^\mp p \rightarrow p\eta 3\pi$
80 to 300	22	FLATTE	76	RVUE	$4.2 K^- p \rightarrow \Lambda\eta 2\pi$
16.0 $^{+25.0}_{-16.0}$	70	WELLS	75	HBC	$3.1-6 K^- p \rightarrow \Lambda\eta 2\pi$
30 \pm 5	150	DEFOIX	72	HBC	$0.7 \bar{p}p \rightarrow 7\pi$
40 \pm 15		CAMPBELL	69	DBC	$2.7 \pi^+ d$
60 \pm 30	15	MILLER	69B	HBC	$4.5 K^- N \rightarrow \eta\pi\Lambda$
80 \pm 30	30	AMMAR	68	HBC	$5.5 K^- p \rightarrow \Lambda\eta 2\pi$

16 From a fit with the S-wave amplitude including two interfering Breit-Wigners plus a background term.

NODE=M036W1;LINKAGE=UE

17 From the T-matrix pole on sheet II, using AMSLER 94D and ABELE 98.

NODE=M036W1;LINKAGE=BU

18 T-matrix pole.

NODE=M036W1;LINKAGE=AN

19 The $\eta\pi$ width.

NODE=M036W1;LINKAGE=BE

20 From a single Breit-Wigner fit.

NODE=M036W1;LINKAGE=A

21 From $f_1(1285)$ decay.

NODE=M036W1;LINKAGE=R

22 Using a two-channel resonance parametrization of GAY 76B data.

NODE=M036W1;LINKAGE=F

$K\bar{K}$ ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
92± 8		23 ABELE	98	CBAR	0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
~ 24		24 OLLER	99C	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
~ 25	100	25 ASTIER	67	HBC	±
57±13	143	26 ROSENFELD	65	RVUE	±

• • • We do not use the following data for averages, fits, limits, etc. • • •

~ 24 24 OLLER 99C RVUE $\pi\pi \rightarrow \pi\pi, K\bar{K}$

~ 25 25 ASTIER 67 HBC ±

57±13 143 26 ROSENFELD 65 RVUE ±

23 T-matrix pole on sheet II, the pole on sheet III is at 1006-i49 MeV.

24 T-matrix pole.

25 ASTIER 67 includes data of BARLOW 67, CONFORTO 67, ARMENTEROS 65.

26 Plus systematic errors.

NODE=M036W2

NODE=M036W2

NODE=M036W2;LINKAGE=Q

NODE=M036W2;LINKAGE=AN

NODE=M036W2;LINKAGE=A

NODE=M036W2;LINKAGE=S

 $a_0(980)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \eta\pi$	dominant
$\Gamma_2 K\bar{K}$	seen
$\Gamma_3 \rho\pi$	
$\Gamma_4 \gamma\gamma$	seen
$\Gamma_5 e^+e^-$	

 $a_0(980)$ PARTIAL WIDTHS **$\Gamma(\gamma\gamma)$**

VALUE (keV)	EVTS	DOCUMENT ID	TECN
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.30±0.10 27 AMSLER 98 RVUE

27 Using $\Gamma_{\gamma\gamma} B(a_0(980) \rightarrow \eta\pi) = 0.24 \pm 0.08$ keV.

 Γ_4

NODE=M036217

NODE=M036W4

NODE=M036W4

 $a_0(980) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$ **$\Gamma(\eta\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$**

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	------	-------------	------	---------

0.21 +0.08 -0.04 OUR AVERAGE

0.128 +0.003 +0.502 -0.002 -0.043	28 UEHARA	09A BELL	$\gamma\gamma \rightarrow \pi^0\eta$
0.28 ± 0.04 ± 0.10	44 OEST	90 JADE	$e^+e^- \rightarrow e^+e^-\pi^0\eta$
0.19 ± 0.07 +0.10 -0.07	ANTREASYAN 86	CBAL	$e^+e^- \rightarrow e^+e^-\pi^0\eta$

28 From a fit with the S-wave amplitude including two interfering Breit-Wigners plus a background term.

 $\Gamma_1\Gamma_4/\Gamma$

NODE=M036W4;LINKAGE=A

NODE=M036220

NODE=M036G1

NODE=M036G1

 $\Gamma(\eta\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<1.5	90	VOROBYEV	88 ND	$e^+e^- \rightarrow \pi^0\eta$

 $\Gamma_1\Gamma_5/\Gamma$

NODE=M036G1;LINKAGE=UE

NODE=M036G2

NODE=M036G2

 $a_0(980)$ BRANCHING RATIOS **$\Gamma(K\bar{K})/\Gamma(\eta\pi)$**

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
-------	-------------	------	-----	---------

0.183±0.024 OUR AVERAGE Error includes scale factor of 1.2.

0.57 ± 0.16	29 BARGIOTTI	03 OBLX	$\bar{p}p$
0.23 ± 0.05	30 ABELE	98 CBAR	0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
0.166±0.01 ±0.02	31 BARBERIS	98C OMEG	450 $p p \rightarrow p_f f_1(1285) p_s$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.20 ± 0.15 32 ANISOVICH 09 RVUE 0.0 $\bar{p}p, \pi N$

1.05 ± 0.07 ± 0.05 33 BUGG 08A RVUE 0 $\bar{p}p \rightarrow \pi^0\pi^0\eta$

~ 0.60 OLLER 99B RVUE $\pi\pi \rightarrow \eta\pi, K\bar{K}$

0.7 ± 0.3 31 CORDEN 78 OMEG 12-15 $\pi^- p \rightarrow n\eta/2\pi$

0.25 ± 0.08 31 DEFOIX 72 HBC ± 0.7 $\bar{p} \rightarrow 7\pi$

 Γ_2/Γ_1

NODE=M036225

NODE=M036R2

NODE=M036R2

$\Gamma(\rho\pi)/\Gamma(\eta\pi)$ $\rho\pi$ forbidden.

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT	Γ_3/Γ_1
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.25	70	AMMAR	70	HBC	\pm 4.1,5.5 $K^- p \rightarrow \Lambda\eta 2\pi$	
29	Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^0 \pi^\mp$.					NODE=M036R;LINKAGE=BG
30	Using $\pi^0 \pi^0 \eta$ from AMSLER 94D.					NODE=M036R2;LINKAGE=Q
31	From the decay of $f_1(1285)$.					NODE=M036R2;LINKAGE=L
32	This is a ratio of couplings.					NODE=M036R2;LINKAGE=AN
33	A ratio of couplings, using AMSLER 94D and ABELE 98. Supersedes BUGG 94.					NODE=M036R2;LINKAGE=BU

 $a_0(980)$ REFERENCES

AMBROSINO 09F	PL B681 5	F. Ambrosino <i>et al.</i>	(KLOE Collab.)	NODE=M036R1
ANISOVICH 09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev		NODE=M036R1
UEHARA 09A	PR D80 032001	S. Uehara <i>et al.</i>	(BELLE Collab.)	NODE=M036R1
BUGG 08A	PR D78 074023	D.V. Bugg	(LOQM)	
ACHASOV 03B	PR D68 014006	N.N. Achasov, A.V. Kiselev		
BARGIOTTI 03	EPJ C26 371	M. Bargiotti <i>et al.</i>	(OBELIX Collab.)	REFID=53105
ACHARD 02B	PL B526 269	P. Achard <i>et al.</i>	(L3 Collab.)	REFID=52719
ACHASOV 00F	PL B479 53	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=53002
BARBERIS 00H	PL B488 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=52578
OLLER 99	PR D60 099906 (erratum)	J.A. Oller <i>et al.</i>		REFID=49476
OLLER 99B	NP A652 407 (erratum)	J.A. Oller, E. Oset		REFID=49217
OLLER 99C	PR D60 074023	J.A. Oller, E. Oset		REFID=48574
TEIGE 99	PR D59 012001	S. Teige <i>et al.</i>	(BNL E852 Collab.)	REFID=47928
ABELE 98	PR D57 3860	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=47964
ACHASOV 98B	PL B438 441	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=46899
AMSLER 98	RMP 70 1293	C. Amsler		REFID=46924
ANISOVICH 98B	SPU 41 419	V.V. Anisovich <i>et al.</i>		REFID=47386
	Translated from UFN 168 481.			REFID=46613
BARBERIS 98C	PL B440 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=45863
BERTIN 98B	PL B434 180	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=46317
TORNQVIST 96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)	REFID=46601
JANSSEN 95	PR D52 2690	G. Janssen <i>et al.</i>	(STON, ADLD, JULI)	REFID=46331
AMSLER 94C	PL B327 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=46346
AMSLER 94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=46351
BUGG 94	PR D50 4412	D.V. Bugg <i>et al.</i>	(LOQM)	REFID=44507
AMSLER 92	PL B291 347	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44508
ARMSTRONG 91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=44091
OEST 90	ZPHY C47 343	T. Oest <i>et al.</i>	(JADE Collab.)	REFID=44093
ACHASOV 89	NP B315 465	N.N. Achasov, V.N. Ivanchenko		REFID=44078
VOROBYEV 88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)	REFID=43169
	Translated from YAF 48 436.			REFID=41862
ANTREASYAN 86	PR D33 1847	D. Antreasyan <i>et al.</i>	(Crystal Ball Collab.)	REFID=41358
ATKINSON 84E	PL 138B 459	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=48021
EVANGELIS... 81	NP B178 197	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)	REFID=41023
DEBILLY 80	NP B176 1	L. de Billy <i>et al.</i>	(CURIN, LAUS, NEUC+)	
GURTU 79	NP B151 181	A. Gurtu <i>et al.</i>	(CERN, ZEEM, NIJM, OXF)	
CONFORTO 78	LNC 23 419	B. Conforto <i>et al.</i>	(RHEL, TNTO, CHIC+)	
CORDEN 78	NP B144 253	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+)	
GRASSLER 77	NP B121 189	H. Grassler <i>et al.</i>	(AACH3, BERL, BONN+)	
JAFFE 77	PR D15 267,281	R. Jaffe	(MIT)	
FLATTE 76	PL 63B 224	S.M. Flatté	(CERN)	
GAY 76B	PL 63B 220	J.B. Gay <i>et al.</i>	(CERN, AMST, NIJM) JP	
WELLS 75	NP B101 333	J. Wells <i>et al.</i>	(OXF)	
DEFOIX 72	NP B44 125	C. Defoix <i>et al.</i>	(CDEF, CERN)	
AMMAR 70	PR D2 430	R. Ammar <i>et al.</i>	(KANS, NWES, ANL, WISC)	
BARNES 69C	PRL 23 610	V.E. Barnes <i>et al.</i>	(BNL, SYRA)	
CAMPBELL 69	PRL 22 1204	J.H. Campbell <i>et al.</i>	(PURD)	
MILLER 69B	PL 29B 255	D.H. Miller <i>et al.</i>	(PURD)	
Also	PR 188 2011	W.L. Yen <i>et al.</i>	(PURD)	
AMMAR 68	PRL 21 1832	R. Ammar <i>et al.</i>	(NWES, ANL)	
ASTIER 67	PL 25B 294	A. Astier <i>et al.</i>	(CDEF, CERN, IRAD)	
	Includes data of BARLOW 67, CONFORTO 67, and ARMENTEROS 65.			
BARLOW 67	NC 50A 701	J. Barlow <i>et al.</i>	(CERN, CDEF, IRAD, LIVP)	REFID=20041
CONFORTO 67	NP B3 469	G. Conforto <i>et al.</i>	(CERN, CDEF, IPNP+)	REFID=20411
ARMENTEROS 65	PL 17 344	R. Armenteros <i>et al.</i>	(CERN, CDEF)	REFID=20396
ROSENFELD 65	Oxford Conf. 58	A.H. Rosenfeld	(LRL)	REFID=20399

NODE=M004

 $\phi(1020)$ $I^G(J^{PC}) = 0^-(1^- -)$ **$\phi(1020)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1019.455±0.020 OUR AVERAGE				Error includes scale factor of 1.1.
1019.30 ± 0.02 ± 0.10	105k	AKHMETSHIN 06	CMD2	$0.98\text{--}1.06 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
1019.52 ± 0.05 ± 0.05	17.4k	AKHMETSHIN 05	CMD2	$0.60\text{--}1.38 e^+ e^- \rightarrow \eta \gamma$
1019.483±0.011±0.025	272k	1 AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow K_L^0 K_S^0$
1019.42 ± 0.05	1900k	2 ACHASOV 01E	SND	$e^+ e^- \rightarrow K^+ K^-, K_S K_L, \pi^+ \pi^- \pi^0$
1019.40 ± 0.04 ± 0.05	23k	AKHMETSHIN 01B	CMD2	$e^+ e^- \rightarrow \eta \gamma$
1019.36 ± 0.12		3 ACHASOV 00B	SND	$e^+ e^- \rightarrow \eta \gamma$
1019.38 ± 0.07 ± 0.08	2200	4 AKHMETSHIN 99F	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \geq 2\gamma$
1019.51 ± 0.07 ± 0.10	11169	AKHMETSHIN 98	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
1019.5 ± 0.4		BARBERIS 98	OMEG	$450 pp \rightarrow pp 2K^+ 2K^-$
1019.42 ± 0.06	55600	AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow \text{hadrons}$
1019.7 ± 0.3	2012	DAVENPORT 86	MPSF	$400 pA \rightarrow 4KX$
1019.7 ± 0.1 ± 0.1	5079	ALBRECHT 85D	ARG	$10 e^+ e^- \rightarrow K^+ K^- X$
1019.3 ± 0.1	1500	ARENTON 82	AEMS	$11.8 \text{ polar. } pp \rightarrow KK$
1019.67 ± 0.17	25080	5 PELLINEN 82	RVUE	
1019.52 ± 0.13	3681	BUKIN 78C	OLYA	$e^+ e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1019.441±0.008±0.080	542k	6 AKHMETSHIN 08	CMD2	$1.02 e^+ e^- \rightarrow K^+ K^-$
1019.63 ± 0.07	12540	7 AUBERT,B 05J	BABR	$D^0 \rightarrow \bar{K}^0 K^+ K^-$
1019.8 ± 0.7		ARMSTRONG 86	OMEG	$\pi^+ / pp \rightarrow \pi^+ / p4Kp$
1020.1 ± 0.11	5526	7 ATKINSON 86	OMEG	$20\text{--}70 \gamma p$
1019.7 ± 1.0		BEBEK 86	CLEO	$e^+ e^- \rightarrow \gamma(4S)$
1019.411±0.008	642k	8 DIJKSTRA 86	SPEC	$100\text{--}200 \pi^\pm, \bar{p}, p, K^\pm, \text{on Be}$
1020.9 ± 0.2		7 FRAME 86	OMEG	$13 K^+ p \rightarrow \phi K^+ p$
1021.0 ± 0.2		7 ARMSTRONG 83B	OMEG	$18.5 K^- p \rightarrow K^- K^+ \Lambda$
1020.0 ± 0.5		7 ARMSTRONG 83B	OMEG	$18.5 K^- p \rightarrow K^- K^+ \Lambda$
1019.7 ± 0.3		7 BARATE 83	GOLI	$190 \pi^- \text{Be} \rightarrow 2\mu X$
1019.8 ± 0.2 ± 0.5	766	IVANOV 81	OLYA	$1\text{--}1.4 e^+ e^- \rightarrow K^+ K^-$
1019.4 ± 0.5	337	COOPER 78B	HBC	$0.7\text{--}0.8 \bar{p}p \rightarrow K_S^0 K_L^0 \pi^+ \pi^-$
1020 ± 1	383	7 BALDI 77	CNTR	$10 \pi^- p \rightarrow \pi^- \phi p$
1018.9 ± 0.6	800	COHEN 77	ASPK	$6 \pi^\pm N \rightarrow K^+ K^- N$
1019.7 ± 0.5	454	KALBFLEISCH 76	HBC	$2.18 K^- p \rightarrow \Lambda K \bar{K}$
1019.4 ± 0.8	984	BESCH 74	CNTR	$2 \gamma p \rightarrow p K^+ K^-$
1020.3 ± 0.4	100	BALLAM 73	HBC	$2.8\text{--}9.3 \gamma p$
1019.4 ± 0.7		BINNIE 73B	CNTR	$\pi^- p \rightarrow \phi n$
1019.6 ± 0.5	120	9 AGUILAR-...	HBC	$3.9, 4.6 K^- p \rightarrow \Lambda K^+ K^-$
1019.9 ± 0.5	100	9 AGUILAR-...	HBC	$3.9, 4.6 K^- p \rightarrow K^- p K^+ K^-$
1020.4 ± 0.5	131	COLLEY 72	HBC	$10 K^+ p \rightarrow K^+ p \phi$
1019.9 ± 0.3	410	STOTTLE...	HBC	$2.9 K^- p \rightarrow \Sigma/\Lambda K \bar{K}$

NODE=M004M

NODE=M004M

OCCUR=2

OCCUR=2

OCCUR=2

NODE=M004M;LINKAGE=GS

NODE=M004M;LINKAGE=AE

NODE=M004M;LINKAGE=G2

NODE=M004M;LINKAGE=F2

¹ Update of AKHMETSHIN 99D² From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of $K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$, and $\eta \gamma$ decays modes and using ACHASOV 00B for the $\eta \gamma$ decay mode.³ Using a total width of 4.43 ± 0.05 MeV. Systematic uncertainty included.⁴ Using a total width of 4.43 ± 0.05 MeV.

⁵ PELLINEN 82 review includes AKERLOF 77, DAUM 81, BALDI 77, AYRES 74, DE-GROOT 74.

⁶ Strongly correlated with AKHMETSHIN 04.

⁷ Systematic errors not evaluated.

⁸ Weighted and scaled average of 12 measurements of DIJKSTRA 86.

⁹ Mass errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.

$\phi(1020)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
4.26 ± 0.04 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.		
4.30 ± 0.06 ± 0.17	105k	AKHMETSHIN 06	CMD2	$0.98-1.06 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
4.280 ± 0.033 ± 0.025	272k	¹ AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow K_L^0 K_S^0$
4.21 ± 0.04	1900k	² ACHASOV	01E SND	$e^+e^- \rightarrow K^+K^-, K_S K_L, \pi^+\pi^-\pi^0$
4.44 ± 0.09	55600	AKHMETSHIN 95	CMD2	$e^+e^- \rightarrow \text{hadrons}$
4.5 ± 0.7	1500	ARENTON	82 AEMS	$11.8 \text{ polar. } pp \rightarrow K K$
4.2 ± 0.6	766	³ IVANOV	81 OLYA	$1-1.4 e^+e^- \rightarrow K^+K^-$
4.3 ± 0.6		³ CORDIER	80 DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
4.36 ± 0.29	3681	³ BUKIN	78C OLYA	$e^+e^- \rightarrow \text{hadrons}$
4.4 ± 0.6	984	³ BESCH	74 CNTR	$2\gamma p \rightarrow p K^+K^-$
4.67 ± 0.72	681	³ BALAKIN	71 OSPK	$e^+e^- \rightarrow \text{hadrons}$
4.09 ± 0.29		BIZOT	70 OSPK	$e^+e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.24 ± 0.02 ± 0.03	542k	⁴ AKHMETSHIN 08	CMD2	$1.02 e^+e^- \rightarrow K^+K^-$
4.28 ± 0.13	12540	⁵ AUBERT,B	05J BABR	$D^0 \rightarrow \bar{K}^0 K^+K^-$
4.45 ± 0.06	271k	DIJKSTRA	86 SPEC	$100 \pi^- \text{ Be}$
3.6 ± 0.8	337	³ COOPER	78B HBC	$0.7-0.8 \bar{p}p \rightarrow K_S^0 K_L^0 \pi^+\pi^-$
4.5 ± 0.50	1300	3,5 AKERLOF	77 SPEC	$400 \mu A \rightarrow K^+K^-X$
4.5 ± 0.8	500	3,5 AYRES	74 ASPK	$3-6 \pi^- p \rightarrow K^+K^-n, K^-p \rightarrow K^+K^-\Lambda/\Sigma^0$
3.81 ± 0.37		COSME	74B OSPK	$e^+e^- \rightarrow K_L^0 K_S^0$
3.8 ± 0.7	454	³ BORENSTEIN	72 HBC	$2.18 K^-p \rightarrow K\bar{K}n$

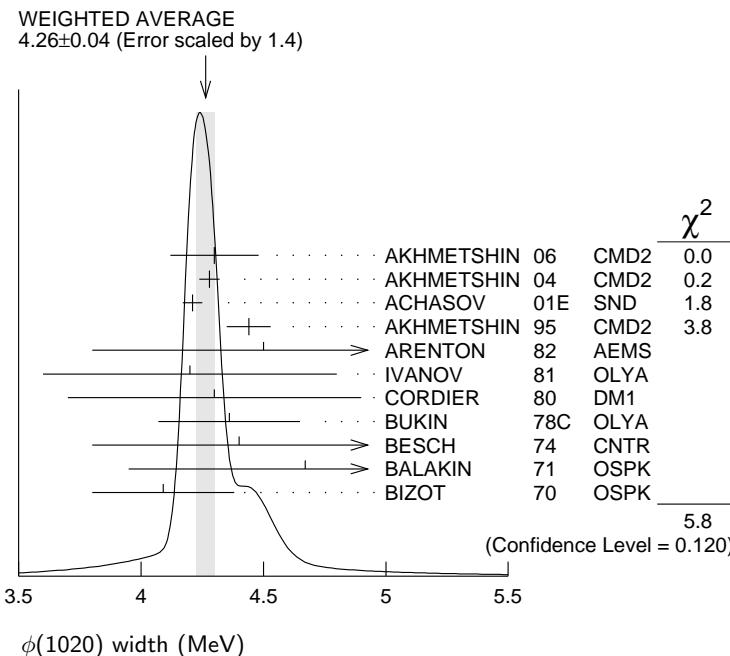
¹ Update of AKHMETSHIN 99D

² From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of K^+K^- , $K_S K_L$, $\pi^+\pi^-\pi^0$, and $\eta\gamma$ decays modes and using ACHASOV 00B for the $\eta\eta$ decay mode.

³ Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

⁴ Strongly correlated with AKHMETSHIN 04.

⁵ Systematic errors not evaluated.



NODE=M004M;LINKAGE=R

NODE=M004M;LINKAGE=AH

NODE=M004M;LINKAGE=A

NODE=M004M;LINKAGE=B

NODE=M004M;LINKAGE=D

NODE=M004W

NODE=M004W

NODE=M004W;LINKAGE=GS

NODE=M004W;LINKAGE=AE

NODE=M004W;LINKAGE=D

NODE=M004W;LINKAGE=AH

NODE=M004W;LINKAGE=A

$\phi(1020)$ DECAY MODES

NODE=M004215;NODE=M004

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
$\Gamma_1 K^+ K^-$	(48.9 \pm 0.5) %	S=1.1	DESIG=1
$\Gamma_2 K_L^0 K_S^0$	(34.2 \pm 0.4) %	S=1.1	DESIG=2
$\Gamma_3 \rho\pi + \pi^+\pi^-\pi^0$	(15.32 \pm 0.32) %	S=1.1	DESIG=24
$\Gamma_4 \rho\pi$			DESIG=16
$\Gamma_5 \pi^+\pi^-\pi^0$			DESIG=3
$\Gamma_6 \eta\gamma$	(1.309 \pm 0.024) %	S=1.2	DESIG=4
$\Gamma_7 \pi^0\gamma$	(1.27 \pm 0.06) $\times 10^{-3}$		DESIG=7
$\Gamma_8 \ell^+\ell^-$	—		DESIG=256;OUR EVAL; \rightarrow UNCHECKED \leftarrow
$\Gamma_9 e^+e^-$	(2.954 \pm 0.030) $\times 10^{-4}$	S=1.1	DESIG=5
$\Gamma_{10} \mu^+\mu^-$	(2.87 \pm 0.19) $\times 10^{-4}$		DESIG=6
$\Gamma_{11} \eta e^+e^-$	(1.15 \pm 0.10) $\times 10^{-4}$		DESIG=17
$\Gamma_{12} \pi^+\pi^-$	(7.4 \pm 1.3) $\times 10^{-5}$		DESIG=8
$\Gamma_{13} \omega\pi^0$	(4.7 \pm 0.5) $\times 10^{-5}$		DESIG=25
$\Gamma_{14} \omega\gamma$	< 5 %	CL=84%	DESIG=10
$\Gamma_{15} \rho\gamma$	< 1.2 $\times 10^{-5}$	CL=90%	DESIG=12
$\Gamma_{16} \pi^+\pi^-\gamma$	(4.1 \pm 1.3) $\times 10^{-5}$		DESIG=9
$\Gamma_{17} f_0(980)\gamma$	(3.22 \pm 0.19) $\times 10^{-4}$	S=1.1	DESIG=20
$\Gamma_{18} \pi^0\pi^0\gamma$	(1.13 \pm 0.06) $\times 10^{-4}$		DESIG=19
$\Gamma_{19} \pi^+\pi^-\pi^+\pi^-$	(4.0 \pm 2.8) $\times 10^{-6}$		DESIG=15
$\Gamma_{20} \pi^+\pi^+\pi^-\pi^-\pi^0$	< 4.6 $\times 10^{-6}$	CL=90%	DESIG=14
$\Gamma_{21} \pi^0e^+e^-$	(1.12 \pm 0.28) $\times 10^{-5}$		DESIG=21
$\Gamma_{22} \pi^0\eta\gamma$	(7.27 \pm 0.30) $\times 10^{-5}$	S=1.5	DESIG=22
$\Gamma_{23} a_0(980)\gamma$	(7.6 \pm 0.6) $\times 10^{-5}$		DESIG=23
$\Gamma_{24} K^0\bar{K}^0\gamma$	< 1.9 $\times 10^{-8}$	CL=90%	DESIG=257
$\Gamma_{25} \eta'(958)\gamma$	(6.25 \pm 0.21) $\times 10^{-5}$		DESIG=194
$\Gamma_{26} \eta\pi^0\pi^0\gamma$	< 2 $\times 10^{-5}$	CL=90%	DESIG=195
$\Gamma_{27} \mu^+\mu^-\gamma$	(1.4 \pm 0.5) $\times 10^{-5}$		DESIG=196
$\Gamma_{28} \rho\gamma\gamma$	< 1.2 $\times 10^{-4}$	CL=90%	DESIG=250
$\Gamma_{29} \eta\pi^+\pi^-$	< 1.8 $\times 10^{-5}$	CL=90%	DESIG=255
$\Gamma_{30} \eta\mu^+\mu^-$	< 9.4 $\times 10^{-6}$	CL=90%	DESIG=26
Lepton Family number (LF) violating modes			
$\Gamma_{31} e^\pm\mu^\mp$	LF < 2 $\times 10^{-6}$	CL=90%	NODE=M004;CLUMP=A DESIG=258

CONSTRAINED FIT INFORMATION

An overall fit to 30 branching ratios uses 79 measurements and one constraint to determine 14 parameters. The overall fit has a $\chi^2 = 57.4$ for 66 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_2	x_3	x_6	x_7	x_9	x_{10}	x_{12}	x_{13}	x_{17}	x_{18}	x_{19}	x_{23}	x_{25}
	-72	-53 -21	-13 7 2	-5 3 1 5	30 -25 -10 -32 -15	-4 3 1 3 2 -11	-2 1 0 2 1 -5 1	-2 2 1 2 1 -7 1 0	0 0 0 0 0 0 0 0	-6 4 2 17 3 -17 2 1 1 0	0 0 0 0 0 -1 0 0 0 0	0 0 0 0 0 0 0 0 0 0	-4 2 1 32 2 -10 1 1 1 0
x_1													
	x_2												
		x_3											
			x_6										
				x_7									
					x_9								
						x_{10}							
							x_{12}						
								x_{13}					
									x_{17}				
										x_{18}			
											x_{19}		
												x_{23}	
													x_{25}

x_{19}	0			
x_{23}	0	0		
x_{25}	5	0	0	

$x_{18} \quad x_{19} \quad x_{23}$

 $\phi(1020)$ PARTIAL WIDTHS **$\Gamma(\eta\gamma)$**

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$58.9 \pm 0.5 \pm 2.4$ ACHASOV 00 SND $e^+ e^- \rightarrow \eta\gamma$

 Γ_6 **$\Gamma(\pi^0\gamma)$**

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$5.40 \pm 0.16^{+0.43}_{-0.40}$ ACHASOV 00 SND $e^+ e^- \rightarrow \pi^0\gamma$

 Γ_7 **$\Gamma(e^+e^-)$**

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$1.320 \pm 0.017 \pm 0.015$ ¹AMBROSINO 05 KLOE 1.02 $e^+ e^- \rightarrow \mu^+ \mu^-$

 Γ_8 **$\Gamma(e^+e^-)$**

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

1.27 ± 0.04 OUR EVALUATION

1.251 ± 0.021 OUR AVERAGE Error includes scale factor of 1.1.

$1.235 \pm 0.006 \pm 0.022$ ²AKHMETSHIN 11 CMD2 1.02 $e^+ e^- \rightarrow \phi$
 $1.32 \pm 0.05 \pm 0.03$ ³AMBROSINO 05 KLOE 1.02 $e^+ e^- \rightarrow e^+ e^-$
 1.28 ± 0.05 AKHMETSHIN 95 CMD2 1.02 $e^+ e^- \rightarrow \phi$

 Γ_9 **$(\Gamma(e^+e^-) \times \Gamma(\mu^+\mu^-))^{1/2}$**

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

$1.320 \pm 0.018 \pm 0.017$ AMBROSINO 05 KLOE 1.02 $e^+ e^- \rightarrow \mu^+ \mu^-$

 $(\Gamma_9 \Gamma_{10})^{1/2}$

¹ Weighted average of Γ_{ee} and $\sqrt{\Gamma_{ee}\Gamma_{\mu\mu}}$ from AMBROSINO 05 assuming lepton universality.

² Combined analysis of the CMD-2 data on $\phi \rightarrow K^+ K^-, K_S^0 K_L^0, \pi^+ \pi^- \pi^0, \eta\gamma$ assuming that the sum of their branching fractions is 0.99741 ± 0.00007 .

³ From forward-backward asymmetry and using $\Gamma_{total} = 4.26 \pm 0.05$ MeV from the 2004 edition of this Review.

NODE=M004218

NODE=M004W6
NODE=M004W6

NODE=M004W7
NODE=M004W7

NODE=M004W5
NODE=M004W5

NODE=M004W8
NODE=M004W8
→ UNCHECKED ←

NODE=M004W9
NODE=M004W9

NODE=M004W5;LINKAGE=AM

NODE=M004W8;LINKAGE=AK

NODE=M004W8;LINKAGE=AM

NODE=M004224

NODE=M004G10
NODE=M004G10

NODE=M004G6
NODE=M004G6

 $\phi(1020) \Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$ **$\Gamma(K^+K^-)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$** **$\Gamma_1/\Gamma \times \Gamma_9/\Gamma$**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
--------------------------	------	-------------	------	---------

14.46 ± 0.23 OUR FIT Error includes scale factor of 1.1.

14.24 ± 0.30 OUR AVERAGE

$14.27 \pm 0.05 \pm 0.31$ 542k AKHMETSHIN 08 CMD2 1.02 $e^+ e^- \rightarrow K^+ K^-$
 $13.93 \pm 0.14 \pm 0.99$ 1000k ¹ACHASOV 01E SND $e^+ e^- \rightarrow K^+ K^-, K_S^0 K_L^0, \pi^+ \pi^- \pi^0$

 $\Gamma(K_S^0 K_L^0)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ **$\Gamma_2/\Gamma \times \Gamma_9/\Gamma$**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
--------------------------	------	-------------	------	---------

10.10 ± 0.13 OUR FIT

10.06 ± 0.16 OUR AVERAGE

$10.01 \pm 0.04 \pm 0.17$ 272k ²AKHMETSHIN 04 CMD2 $e^+ e^- \rightarrow K_L^0 K_S^0$
 $10.27 \pm 0.07 \pm 0.34$ 500k ¹ACHASOV 01E SND $e^+ e^- \rightarrow K^+ K^-, K_S^0 K_L^0, \pi^+ \pi^- \pi^0$

$\Gamma(\rho\pi) + \Gamma(\pi^+\pi^-\pi^0)]/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_3/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
4.53 ± 0.10 OUR FIT		Error includes scale factor of 1.1.		
4.46 ± 0.12 OUR AVERAGE				
4.51 ± 0.16 ± 0.11	105k	AKHMETSHIN 06	CMD2	$0.98-1.06 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
4.30 ± 0.08 ± 0.21		AUBERT,B 04N	BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
4.665 ± 0.042 ± 0.261	400k	¹ ACHASOV 01E	SND	$e^+e^- \rightarrow K^+K^-$, $K_S K_L, \pi^+\pi^-\pi^0$
4.35 ± 0.27 ± 0.08	11169	³ AKHMETSHIN 98	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.38 ± 0.12		BENAYOUN 10	RVUE	0.4–1.05 e^+e^-

NODE=M004G7

NODE=M004G7

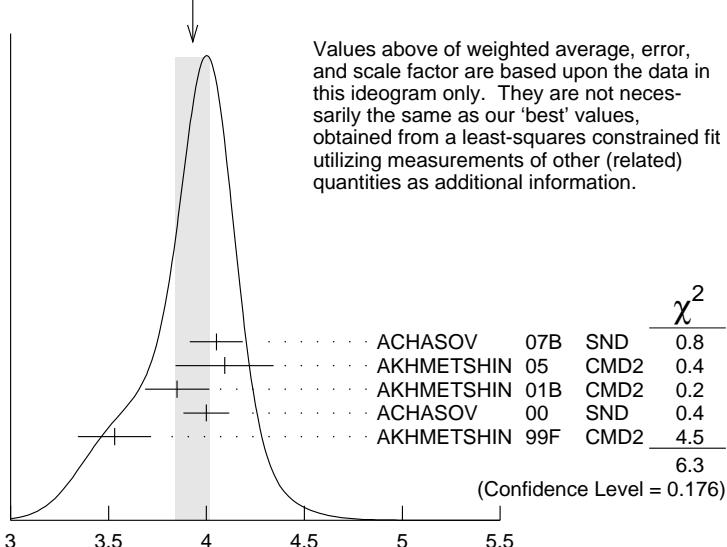
 $\Gamma(\eta\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_6/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
3.87 ± 0.07 OUR FIT		Error includes scale factor of 1.2.		
3.93 ± 0.09 OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.		
4.050 ± 0.067 ± 0.118	33k	⁴ ACHASOV 07B	SND	$0.6-1.38 e^+e^- \rightarrow \eta\gamma$
4.093 ^{+0.040} _{-0.043} ± 0.247	17.4k	⁵ AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \eta\gamma$
3.850 ± 0.041 ± 0.159	23k	^{6,7} AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$
4.00 ± 0.04 ± 0.11		⁸ ACHASOV 00	SND	$e^+e^- \rightarrow \eta\gamma$
3.53 ± 0.08 ± 0.17	2200	^{9,10} AKHMETSHIN 99F	CMD2	$e^+e^- \rightarrow \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.19 ± 0.06		¹¹ BENAYOUN 10	RVUE	0.4–1.05 e^+e^-

NODE=M004G2

NODE=M004G2

WEIGHTED AVERAGE
3.93±0.09 (Error scaled by 1.3)


 $\Gamma(\eta\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_6/\Gamma \times \Gamma_9/\Gamma$
 $\Gamma(\pi^0\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_7/\Gamma \times \Gamma_9/\Gamma$

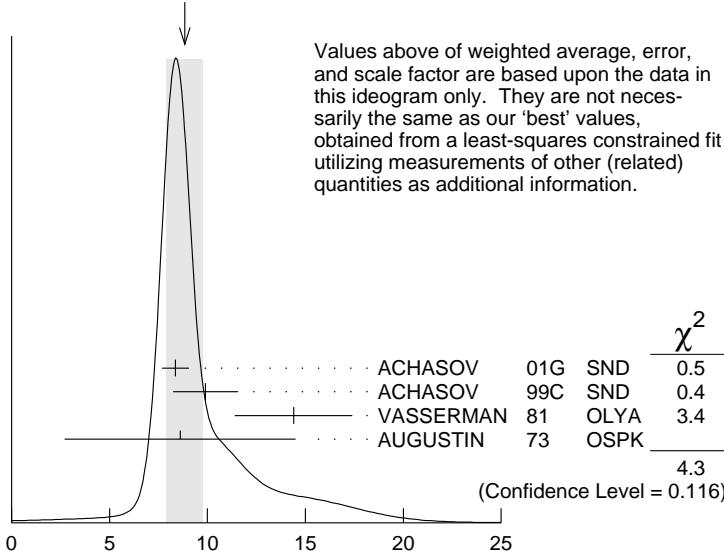
VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
3.74 ± 0.18 OUR FIT				
3.71 ± 0.21 OUR AVERAGE				
3.75 ± 0.11 ± 0.29	18680	AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \pi^0\gamma$
3.67 ± 0.10 ^{+0.27} _{-0.25}		¹² ACHASOV 00	SND	$e^+e^- \rightarrow \pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.29 ± 0.11		¹¹ BENAYOUN 10	RVUE	0.4–1.05 e^+e^-

NODE=M004G3

NODE=M004G3

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{10}/\Gamma \times \Gamma_9/\Gamma$		
VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
8.5 ± 0.5 OUR FIT			
8.8 ± 0.9 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.		
8.36 $\pm 0.59 \pm 0.37$	ACHASOV 01G SND	$e^+ e^- \rightarrow \mu^+ \mu^-$	
9.9 $\pm 1.4 \pm 0.9$	9 ACHASOV 99C SND	$e^+ e^- \rightarrow \mu^+ \mu^-$	
14.4 ± 3.0	3 VASSERMAN 81 OLYA	$e^+ e^- \rightarrow \mu^+ \mu^-$	
8.6 ± 5.9	3 AUGUSTIN 73 OSPK	$e^+ e^- \rightarrow \mu^+ \mu^-$	

WEIGHTED AVERAGE
8.8 ± 0.9 (Error scaled by 1.5)



$$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}} \quad \Gamma_{10}/\Gamma \times \Gamma_9/\Gamma$$

$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{12}/\Gamma \times \Gamma_9/\Gamma$		
VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
2.2 ± 0.4 OUR FIT			
2.2 ± 0.4 OUR AVERAGE			
2.1 $\pm 0.3 \pm 0.3$	9 ACHASOV 00C SND	$e^+ e^- \rightarrow \pi^+ \pi^-$	
1.95 $^{+1.15}_{-0.87}$	3 GOLUBEV 86 ND	$e^+ e^- \rightarrow \pi^+ \pi^-$	
6.01 $^{+3.19}_{-2.51}$	3 VASSERMAN 81 OLYA	$e^+ e^- \rightarrow \pi^+ \pi^-$	

$\Gamma(\omega\pi^0)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{13}/\Gamma \times \Gamma_9/\Gamma$		
VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
1.40 ± 0.15 OUR FIT			
1.37 $\pm 0.17 \pm 0.01$	13,14 AMBROSINO 08G KLOE	$e^+ e^- \rightarrow \pi^+ \pi^- 2\pi^0, 2\pi^0 \gamma$	

$\Gamma(\pi^0\pi^0\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{18}/\Gamma \times \Gamma_9/\Gamma$		
VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
3.34 ± 0.17 OUR FIT			
3.33$^{+0.04}_{-0.09} \pm 0.19$	15 AMBROSINO 07 KLOE	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{19}/\Gamma \times \Gamma_9/\Gamma$			
VALUE (units 10^{-9})	EVTS	DOCUMENT ID	TECN	COMMENT
1.2 ± 0.8 OUR FIT				

$$1.17 \pm 0.52 \pm 0.64 \quad 3285 \quad ^9 \text{AKHMETSHIN } 00E \text{ CMD2} \quad e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^-$$

¹ From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of $K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$, and $\eta \gamma$ decays modes and using AKHMETSHIN 00B for the $\eta \gamma$ decay mode.

² Update of AKHMETSHIN 99D

³ Recalculated by us from the cross section in the peak.

NODE=M004G5
NODE=M004G5

NODE=M004G4
NODE=M004G4

NODE=M004G11
NODE=M004G11

NODE=M004G9
NODE=M004G9

NODE=M004G8
NODE=M004G8

NODE=M004G;LINKAGE=AE

NODE=M004G;LINKAGE=GS
NODE=M004G;LINKAGE=B

- ⁴ From a combined fit of $\sigma(e^+ e^- \rightarrow \eta\gamma)$ with $\eta \rightarrow 3\pi^0$ and $\eta \rightarrow \pi^+\pi^-\pi^0$, and fixing $B(\eta \rightarrow 3\pi^0) / B(\eta \rightarrow \pi^+\pi^-\pi^0) = 1.44 \pm 0.04$. Recalculated by us from the cross section at the peak. Supersedes ACHASOV 00D and ACHASOV 06A.
- ⁵ From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.
- ⁶ From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.
- ⁷ The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively).
- ⁸ From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow 2\gamma) = (39.21 \pm 0.34) \times 10^{-2}$.
- ⁹ Recalculated by the authors from the cross section in the peak.
- ¹⁰ From the $\eta \rightarrow \pi^+\pi^-\pi^0$ decay and using $B(\eta \rightarrow \pi^+\pi^-\pi^0) = (23.1 \pm 0.5) \times 10^{-2}$.
- ¹¹ A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.
- ¹² From the $\pi^0 \rightarrow 2\gamma$ decay and using $B(\pi^0 \rightarrow 2\gamma) = (98.798 \pm 0.032) \times 10^{-2}$.
- ¹³ Recalculated by the authors from the cross section at the peak.
- ¹⁴ AMBROSINO 08G reports $[\Gamma(\phi(1020) \rightarrow \omega\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(\phi(1020) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+\pi^-\pi^0)] = (1.22 \pm 0.13 \pm 0.08) \times 10^{-8}$ which we divide by our best value $B(\omega(782) \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- ¹⁵ Calculated by the authors from the cross section at the peak.

NODE=M004G2;LINKAGE=AH

NODE=M004G2;LINKAGE=AK
 NODE=M004G;LINKAGE=AK
 NODE=M004G;LINKAGE=BQ

NODE=M004G2;LINKAGE=A
 NODE=M004G;LINKAGE=A
 NODE=M004G2;LINKAGE=C
 NODE=M004G7;LINKAGE=BE
 NODE=M004G3;LINKAGE=A
 NODE=M004G11;LINKAGE=AB
 NODE=M004G11;LINKAGE=AM

NODE=M004G9;LINKAGE=AM

NODE=M004220

NODE=M004R1
 NODE=M004R1

$\phi(1020)$ BRANCHING RATIOS

$\Gamma(K^+K^-)/\Gamma_{\text{total}}$	Γ_1/Γ
VALUE	EVTS DOCUMENT ID TECN COMMENT
0.489±0.005 OUR FIT	Error includes scale factor of 1.1.
0.493±0.010 OUR AVERAGE	
0.492±0.012	2913 AKHMETSHIN 95 CMD2 $e^+e^- \rightarrow K^+K^-$
0.44 ± 0.05	321 KALBFLEISCH 76 HBC $2.18 K^- p \rightarrow \Lambda K^+ K^-$
0.49 ± 0.06	270 DEGROOT 74 HBC $4.2 K^- p \rightarrow \Lambda \phi$
0.540±0.034	565 BALAKIN 71 OSPK $e^+e^- \rightarrow K^+K^-$
0.48 ± 0.04	252 LINDSEY 66 HBC $2.1-2.7 K^- p \rightarrow \Lambda K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.493±0.003±0.007	¹ AKHMETSHIN 11 CMD2 $1.02 e^+e^- \rightarrow K^+K^-$
0.476±0.017	1000k ² ACHASOV 01E SND $e^+e^- \rightarrow K^+K^-, K_S K_L, \pi^+\pi^-\pi^0$

$\Gamma(K_L^0 K_S^0)/\Gamma_{\text{total}}$	Γ_2/Γ
VALUE	EVTS DOCUMENT ID TECN COMMENT
0.342±0.004 OUR FIT	Error includes scale factor of 1.1.
0.331±0.009 OUR AVERAGE	
0.335±0.010	40644 AKHMETSHIN 95 CMD2 $e^+e^- \rightarrow K_L^0 K_S^0$
0.326±0.035	DOLINSKY 91 ND $e^+e^- \rightarrow K_L^0 K_S^0$
0.310±0.024	DRUZHININ 84 ND $e^+e^- \rightarrow K_L^0 K_S^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.336±0.002±0.006	¹ AKHMETSHIN 11 CMD2 $1.02 e^+e^- \rightarrow K_S^0 K_L^0$
0.351±0.013	500k ² ACHASOV 01E SND $e^+e^- \rightarrow K^+K^-, K_S K_L, \pi^+\pi^-\pi^0$
0.27 ± 0.03	133 KALBFLEISCH 76 HBC $2.18 K^- p \rightarrow \Lambda K_L^0 K_S^0$
0.257±0.030	95 BALAKIN 71 OSPK $e^+e^- \rightarrow K_L^0 K_S^0$
0.40 ± 0.04	167 LINDSEY 66 HBC $2.1-2.7 K^- p \rightarrow \Lambda K_L^0 K_S^0$

NODE=M004R2
 NODE=M004R2

$\Gamma(K_L^0 K_S^0)/\Gamma(K^+K^-)$	Γ_2/Γ_1
VALUE	EVTS DOCUMENT ID TECN COMMENT
0.698±0.014 OUR FIT	Error includes scale factor of 1.1.
0.740±0.031 OUR AVERAGE	
0.70 ± 0.06	2732 BUKIN 78C OLYA $e^+e^- \rightarrow K_L^0 K_S^0$
0.82 ± 0.08	LOSTY 78 HBC $4.2 K^- p \rightarrow \phi$ hyperon
0.71 ± 0.05	LAVEN 77 HBC $10 K^- p \rightarrow K^+K^-\Lambda$
0.71 ± 0.08	LYONS 77 HBC $3-4 K^- p \rightarrow \Lambda \phi$
0.89 ± 0.10	144 AGUILAR-... 72B HBC $3.9, 4.6 K^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.68 ± 0.03	³ AKHMETSHIN 95 CMD2 $e^+e^- \rightarrow K_L^0 K_S^0, K^+K^-$

NODE=M004R19
 NODE=M004R19

$\Gamma(K_L^0 K_S^0)/\Gamma(K\bar{K})$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.411±0.005 OUR FIT		Error includes scale factor of 1.1.		
0.45 ±0.04 OUR AVERAGE				
0.44 ±0.07		LONDON	66	HBC 2.24 $K^- p \rightarrow \Lambda K\bar{K}$
0.48 ±0.07	52	BADIER	65B	HBC 3 $K^- p$
0.40 ±0.10	34	SCHLEIN	63	HBC 1.95 $K^- p \rightarrow \Lambda K\bar{K}$

 $\Gamma_2/(\Gamma_1+\Gamma_2)$ NODE=M004R5
NODE=M004R5 $[\Gamma(\rho\pi) + \Gamma(\pi^+ \pi^- \pi^0)]/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.1532±0.0032 OUR FIT		Error includes scale factor of 1.1.		
0.151 ±0.009 OUR AVERAGE				Error includes scale factor of 1.7.
0.161 ±0.008	11761	AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.143 ±0.007		DOLINSKY 91	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.155 ±0.002 ±0.005	1	AKHMETSHIN 11	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.159 ±0.008	400k	ACHASOV 01E	SND	$e^+ e^- \rightarrow K^+ K^-$, $K_S K_L, \pi^+ \pi^- \pi^0$
0.145 ±0.009 ±0.003	11169	AKHMETSHIN 98	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.139 ±0.007		PARROUR 76B	OSPK	$e^+ e^-$

 Γ_3/Γ NODE=M004R3
NODE=M004R3 $[\Gamma(\rho\pi) + \Gamma(\pi^+ \pi^- \pi^0)]/\Gamma(K^+ K^-)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.313±0.009 OUR FIT		Error includes scale factor of 1.1.		
0.28 ±0.09	34	AGUILAR...	72B	HBC 3.9,4.6 $K^- p$

 Γ_3/Γ_1 NODE=M004R20
NODE=M004R20 $[\Gamma(\rho\pi) + \Gamma(\pi^+ \pi^- \pi^0)]/\Gamma(K\bar{K})$

VALUE	DOCUMENT ID	TECN	COMMENT
0.184±0.005 OUR FIT	Error includes scale factor of 1.1.		
0.24 ±0.04 OUR AVERAGE			

 $\Gamma_3/(\Gamma_1+\Gamma_2)$ NODE=M004R6
NODE=M004R6 $[\Gamma(\rho\pi) + \Gamma(\pi^+ \pi^- \pi^0)]/\Gamma(K_L^0 K_S^0)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.448±0.012 OUR FIT		Error includes scale factor of 1.1.		
0.51 ±0.05 OUR AVERAGE				

 Γ_3/Γ_2 NODE=M004R7
NODE=M004R7 $\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
≈ 0.0087	1.98M	6,7 ALOISIO 03	KLOE	1.02 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
<0.0006	90	8 ACHASOV 02	SND	1.02 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
<0.23	90	8 CORDIER 80	DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
<0.20	90	8 PARROUR 76B	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	

 Γ_5/Γ NODE=M004R46
NODE=M004R46 $\Gamma(\eta\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.309±0.024 OUR FIT		Error includes scale factor of 1.2.		

 Γ_6/Γ NODE=M004R11
NODE=M004R11**1.26 ±0.04 OUR AVERAGE**

1.246±0.025±0.057	10k	9 ACHASOV 98F	SND	$e^+ e^- \rightarrow 7\gamma$
1.18 ±0.11	279	10 AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
1.30 ±0.06		11 DRUZHININ 84	ND	$e^+ e^- \rightarrow 3\gamma$
1.4 ±0.2		12 DRUZHININ 84	ND	$e^+ e^- \rightarrow 6\gamma$
0.88 ±0.20	290	KURDADZE 83C	OLYA	$e^+ e^- \rightarrow 3\gamma$
1.35 ±0.29		ANDREWS 77	CNTR	6.7-10 γ Cu
1.5 ±0.4	54	11 COSME 76	OSPK	$e^+ e^-$

 Γ_5/Γ NODE=M004R46
NODE=M004R46

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.38 ±0.02 ±0.02		1 AKHMETSHIN 11	CMD2	1.02 $e^+ e^- \rightarrow \eta\gamma$
1.37 ±0.05 ±0.01	33k	13 ACHASOV 07B	SND	0.6-1.38 $e^+ e^- \rightarrow \eta\gamma$
1.373±0.014±0.085	17.4k	14,15 AKHMETSHIN 05	CMD2	0.60-1.38 $e^+ e^- \rightarrow \eta\gamma$
1.287±0.013±0.063		16,17 AKHMETSHIN 01B	CMD2	$e^+ e^- \rightarrow \eta\gamma$
1.338±0.012±0.052		18 ACHASOV 00	SND	$e^+ e^- \rightarrow \eta\gamma$
1.18 ±0.03 ±0.06	2200	19 AKHMETSHIN 99F	CMD2	$e^+ e^- \rightarrow \eta\gamma$
1.21 ±0.07		20 BENAYOUN 96	RVUE	0.54-1.04 $e^+ e^- \rightarrow \eta\gamma$

OCCUR=2

$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$	Γ_7/Γ	NODE=M004R17 NODE=M004R17		
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
1.27 ± 0.06 OUR FIT				
1.31 ± 0.13 OUR AVERAGE				
1.30 ± 0.13		DRUZHININ	84 ND $e^+ e^- \rightarrow 3\gamma$	
1.4 ± 0.5	32	COSME	76 OSPK $e^+ e^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.258 ± 0.037 ± 0.077	18680	21,22 AKHMETSHIN	05 CMD2 0.60-1.38 $e^+ e^- \rightarrow \pi^0\gamma$	
1.226 ± 0.036 ± 0.096		23 ACHASOV	00 SND $e^+ e^- \rightarrow \pi^0\gamma$	
1.26 ± 0.17		20 BENAYOUN	96 RVUE 0.54-1.04 $e^+ e^- \rightarrow \pi^0\gamma$	
$\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$	Γ_6/Γ_7	NODE=M004R42 NODE=M004R42		
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10.9 ± 0.3 ± 0.7		ACHASOV	00 SND $e^+ e^- \rightarrow \eta\gamma, \pi^0\gamma$	
$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$	Γ_9/Γ	NODE=M004R16 NODE=M004R16		
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
2.954 ± 0.030 OUR FIT		Error includes scale factor of 1.1.		
2.98 ± 0.07 OUR AVERAGE		Error includes scale factor of 1.1.		
2.93 ± 0.14	1900k	24 ACHASOV	01E SND $e^+ e^- \rightarrow K^+ K^-, K_S K_L, \pi^+ \pi^- \pi^0$	
2.88 ± 0.09	55600	AKHMETSHIN	95 CMD2 $e^+ e^- \rightarrow \text{hadrons}$	
3.00 ± 0.21	3681	BUKIN	78C OLYA $e^+ e^- \rightarrow \text{hadrons}$	
3.10 ± 0.14		25 PARROUR	76 OSPK $e^+ e^-$	
3.3 ± 0.3		COSME	74 OSPK $e^+ e^- \rightarrow \text{hadrons}$	
2.81 ± 0.25	681	BALAKIN	71 OSPK $e^+ e^- \rightarrow \text{hadrons}$	
3.50 ± 0.27		CHATELUS	71 OSPK $e^+ e^-$	
$\Gamma(\mu^+ \mu^-)/\Gamma_{\text{total}}$	Γ_{10}/Γ	NODE=M004R10 NODE=M004R10		
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
2.87 ± 0.19 OUR FIT				
2.5 ± 0.4 OUR AVERAGE				
2.69 ± 0.46		26 HAYES	71 CNTR 8.3,9.8 $\gamma C \rightarrow \mu^+ \mu^- X$	
2.17 ± 0.60		26 EARLES	70 CNTR 6.0 $\gamma C \rightarrow \mu^+ \mu^- X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.87 ± 0.20 ± 0.14		27 ACHASOV	01G SND $e^+ e^- \rightarrow \mu^+ \mu^-$	
3.30 ± 0.45 ± 0.32		4 ACHASOV	99C SND $e^+ e^- \rightarrow \mu^+ \mu^-$	
4.83 ± 1.02		28 VASSERMAN	81 OLYA $e^+ e^- \rightarrow \mu^+ \mu^-$	
2.87 ± 1.98		28 AUGUSTIN	73 OSPK $e^+ e^- \rightarrow \mu^+ \mu^-$	
$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$	Γ_{11}/Γ	NODE=M004R24 NODE=M004R24		
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
1.15 ± 0.10 OUR AVERAGE				
1.19 ± 0.19 ± 0.12	213	29 ACHASOV	01B SND $e^+ e^- \rightarrow \gamma\gamma e^+ e^-$	
1.14 ± 0.10 ± 0.06	355	30 AKHMETSHIN	01 CMD2 $e^+ e^- \rightarrow \eta e^+ e^-$	
1.3 ± 0.8 -0.6	7	GOLUBEV	85 ND $e^+ e^- \rightarrow \gamma\gamma e^+ e^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.13 ± 0.14 ± 0.07	183	31 AKHMETSHIN	01 CMD2 $e^+ e^- \rightarrow \eta e^+ e^-$	
1.21 ± 0.14 ± 0.09	130	32 AKHMETSHIN	01 CMD2 $e^+ e^- \rightarrow \eta e^+ e^-$	
1.04 ± 0.20 ± 0.08	42	33 AKHMETSHIN	01 CMD2 $e^+ e^- \rightarrow \eta e^+ e^-$	
OCCUR=2				
OCCUR=3				
OCCUR=4				
$\Gamma(\pi^+ \pi^-)/\Gamma_{\text{total}}$	Γ_{12}/Γ	NODE=M004R18 NODE=M004R18		
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.71 ± 0.11 ± 0.09		4 ACHASOV	00C SND $e^+ e^- \rightarrow \pi^+ \pi^-$	
0.65 ± 0.38 -0.29		4 GOLUBEV	86 ND $e^+ e^- \rightarrow \pi^+ \pi^-$	
2.01 ± 1.07 -0.84		4 VASSERMAN	81 OLYA $e^+ e^- \rightarrow \pi^+ \pi^-$	
<6.6	95	BUKIN	78B OLYA $e^+ e^- \rightarrow \pi^+ \pi^-$	
<2.7	95	ALVENSLEB...	72 CNTR 6.7 $\gamma C \rightarrow C \pi^+ \pi^-$	

$\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$ VALUE (units 10^{-5})**4.7±0.5 OUR FIT****5.2^{+1.3}_{-1.1}**

DOCUMENT ID TECN COMMENT

34,35	AULCHENKO	00A	SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.4±0.6	36 AMBROSINO	08G	KLOE	$e^+ e^- \rightarrow \pi^+ \pi^- 2\pi^0, 2\pi^0 \gamma$	
~5.4	37 ACHASOV	00E	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
5.5 ^{+1.6} _{-1.4} ±0.3	35,38 AULCHENKO	00A	SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$	
4.8 ^{+1.9} _{-1.7} ±0.8	37 ACHASOV	99	SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$	

 Γ_{13}/Γ NODE=M004R28
NODE=M004R28

OCCUR=2

 $\Gamma(\omega\gamma)/\Gamma_{\text{total}}$

VALUE CL%

<0.05 84

DOCUMENT ID TECN COMMENT

 Γ_{14}/Γ NODE=M004R14
NODE=M004R14 $\Gamma(\rho\gamma)/\Gamma_{\text{total}}$ VALUE (units 10^{-4}) CL%**< 0.12** 90

DOCUMENT ID TECN COMMENT

 Γ_{15}/Γ NODE=M004R15
NODE=M004R15**< 0.12** 9039 AKHMETSHIN 99B CMD2 $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 7 90

AKHMETSHIN 97C CMD2 $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$

<200 84

LINDSEY 66 HBC 2.1–2.7 $K^- p \rightarrow \Lambda \pi^+ \pi^-$ neutrals $\Gamma(\pi^+ \pi^- \gamma)/\Gamma_{\text{total}}$ VALUE (units 10^{-4}) CL%**0.41±0.12±0.04**

EVTS DOCUMENT ID TECN COMMENT

 Γ_{16}/Γ NODE=M004R12
NODE=M004R12

< 0.3 90

41 AKHMETSHIN 97C CMD2 $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$

<600 90

KALBFLEISCH 75 HBC 2.18 $K^- p \rightarrow$

< 70 90

COSME 74 OSPK $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$

<400 90

LINDSEY 65 HBC 2.1–2.7 $K^- p \rightarrow$ $\Gamma(f_0(980)\gamma)/\Gamma_{\text{total}}$ VALUE (units 10^{-4}) CL%**3.22±0.19 OUR FIT**

Error includes scale factor of 1.1.

3.21±0.19 OUR AVERAGE**3.21^{+0.03}_{-0.09}±0.18**

EVTS DOCUMENT ID TECN COMMENT

 Γ_{17}/Γ NODE=M004R30
NODE=M004R30

2.90±0.21±1.54

42 AMBROSINO 07 KLOE $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$ 43 AKHMETSHIN 99C CMD2 $e^+ e^- \rightarrow \pi^+ \pi^- \gamma, \pi^0 \pi^0 \gamma$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{18}/Γ
1.07 ± 0.06 OUR AVERAGE						
1.07	$+0.01$	$+0.06$	52	AMBROSINO 07	KLOE $e^+e^- \rightarrow \pi^0\pi^0\gamma$	
	-0.03	-0.06				
1.08	± 0.17	± 0.09	268	AKHMETSHIN 99C	CMD2 $e^+e^- \rightarrow \pi^0\pi^0\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.09	± 0.03	± 0.05	2438	ALOISIO 02D	KLOE $e^+e^- \rightarrow \pi^0\pi^0\gamma$	
$1.158 \pm 0.093 \pm 0.052$			419	46,53 ACHASOV 00H	SND $e^+e^- \rightarrow \pi^0\pi^0\gamma$	
< 10		90		DRUZHININ 87	ND $e^+e^- \rightarrow 5\gamma$	

NODE=M004R26
NODE=M004R26

 $\Gamma(\pi^0\pi^0\gamma)/\Gamma(\eta\gamma)$

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{18}/Γ_6	
0.86 ± 0.04 OUR FIT						
$0.865 \pm 0.070 \pm 0.017$	419	53 ACHASOV	00H SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.90	± 0.08	± 0.07	164	ACHASOV 98I	SND $e^+e^- \rightarrow 5\gamma$	

NODE=M004R39
NODE=M004R39

 $\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-6})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{19}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$3.93 \pm 1.74 \pm 2.14$		3285	AKHMETSHIN 00E	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$	
< 870		90	CORDIER	79	WIRE $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$	

NODE=M004R22
NODE=M004R22

 $\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-6})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{20}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 4.6	90		AKHMETSHIN 00E	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-\pi^0$	

NODE=M004R27
NODE=M004R27

 $\Gamma(\pi^0e^+e^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{21}/Γ
1.12 ± 0.28 OUR AVERAGE						
1.01	± 0.28	± 0.29	52	54 ACHASOV 02D	SND $e^+e^- \rightarrow \pi^0e^+e^-$	
$1.22 \pm 0.34 \pm 0.21$		46	55 AKHMETSHIN 01C	CMD2	$e^+e^- \rightarrow \pi^0e^+e^-$	

NODE=M004R31
NODE=M004R31

 $\Gamma(\pi^0\eta\gamma)/\Gamma_{\text{total}}$

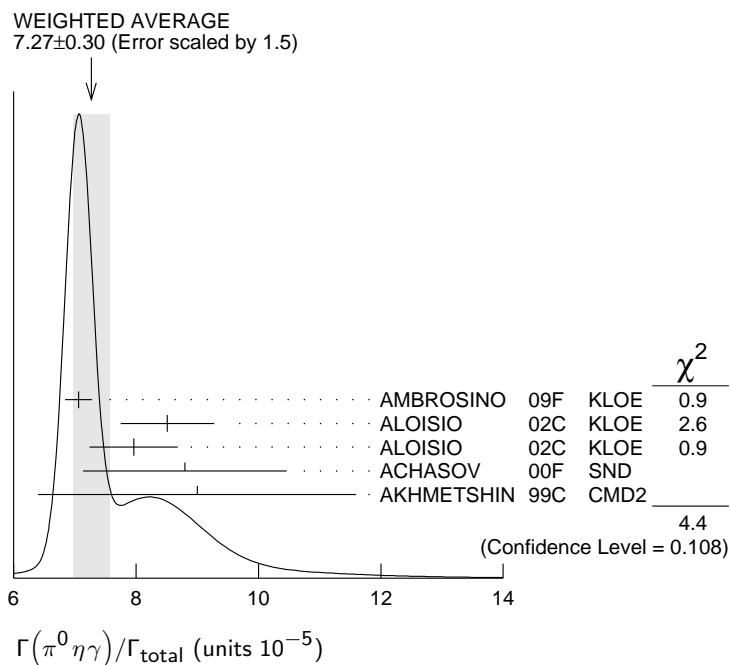
<u>VALUE</u> (units 10^{-5})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{22}/Γ
7.27 ± 0.30 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.						
7.06	± 0.22	16.9k	56 AMBROSINO 09F	KLOE	$1.02 e^+e^- \rightarrow \eta\pi^0\gamma$	
$8.51 \pm 0.51 \pm 0.57$		607	57 ALOISIO 02C	KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$	
$7.96 \pm 0.60 \pm 0.40$		197	58 ALOISIO 02C	KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$	
8.8	± 1.4	± 0.9	36	59 ACHASOV 00F	SND $e^+e^- \rightarrow \eta\pi^0\gamma$	
9.0	± 2.4	± 1.0	80	AKHMETSHIN 99C	CMD2 $e^+e^- \rightarrow \eta\pi^0\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
7.01	± 0.10	± 0.20	13.3k	57,60 AMBROSINO 09F	KLOE $1.02 e^+e^- \rightarrow \eta\pi^0\gamma$	OCCUR=2
$7.12 \pm 0.13 \pm 0.22$		3.6k	58,61 AMBROSINO 09F	KLOE	$1.02 e^+e^- \rightarrow \eta\pi^0\gamma$	OCCUR=3
8.3	± 2.3	± 1.2	20	ACHASOV 98B	SND $e^+e^- \rightarrow 5\gamma$	
< 250		90	DOLINSKY 91	ND	$e^+e^- \rightarrow \pi^0\eta\gamma$	

NODE=M004R32
NODE=M004R32

OCCUR=2

OCCUR=2

OCCUR=3

 $\Gamma(a_0(980)\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
7.6±0.6 OUR FIT					
7.6±0.6 OUR AVERAGE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
7.4±0.7			62 ALOISIO	02C KLOE	$e^+ e^- \rightarrow \eta \pi^0 \gamma$
8.8±1.7		36	63 ACHASOV	00F SND	$e^+ e^- \rightarrow \eta \pi^0 \gamma$
11 ± 2			64 GOKALP	02 RVUE	$e^+ e^- \rightarrow \eta \pi^0 \gamma$
<500	90		DOLINSKY	91 ND	$e^+ e^- \rightarrow \pi^0 \eta \gamma$

 Γ_{23}/Γ NODE=M004R33
NODE=M004R33 $\Gamma(f_0(980)\gamma)/\Gamma(a_0(980)\gamma)$

VALUE	DOCUMENT ID	TECN	COMMENT
6.1±0.6	65 ALOISIO	02C KLOE	$e^+ e^- \rightarrow \eta \pi^0 \gamma$

 Γ_{17}/Γ_{23} NODE=M004R47
NODE=M004R47 $\Gamma(K^0 \bar{K}^0 \gamma)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.9 × 10⁻⁸	90	AMBROSINO	09C KLOE	$e^+ e^- \rightarrow K_S^0 \bar{K}_S^0 \gamma$

 Γ_{24}/Γ NODE=M004R48
NODE=M004R48 $\Gamma(\eta'(958)\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
6.25±0.21 OUR FIT					
6.25±0.30 OUR AVERAGE					

 Γ_{25}/Γ NODE=M004R25
NODE=M004R25 $\Gamma(3407)\gamma$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
6.25±0.28±0.11		3407	66 AMBROSINO	07A KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- 7\gamma$
6.7 ± 2.8	± 0.8	12	67 AULCHENKO	03B SND	$e^+ e^- \rightarrow \eta' \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6.7 ± 5.0	± 1.5	7	AULCHENKO	03B SND	$e^+ e^- \rightarrow 7\gamma$
6.10±0.61±0.43		120	68 ALOISIO	02E KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
8.2 ± 2.1	± 1.1	21	69 AKHMETSHIN	00B CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
4.9 ± 2.2	± 0.6	9	70 AKHMETSHIN	00F CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^- \geq 2\gamma$
6.4 ± 1.6		30	71 AKHMETSHIN	00F CMD2	$e^+ e^- \rightarrow \eta'(958)\gamma$
6.7 ± 3.4	± 1.0	5	72 AULCHENKO	99 SND	$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
<11			AULCHENKO	98 SND	$e^+ e^- \rightarrow 7\gamma$
12 ± 7	± 2	6	69 AKHMETSHIN	97B CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
<41			DRUZHININ	87 ND	$e^+ e^- \rightarrow \gamma \eta \pi^+ \pi^-$

OCCUR=2

OCCUR=2

$\Gamma(\eta'(958)\gamma)/\Gamma(K_L^0 K_S^0)$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{25}/Γ_2</u>
1.83±0.06 OUR FIT					
1.46$^{+0.64}_{-0.54}$±0.18	9	73 AKHMETSHIN 00F	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^- \geq 2\gamma$	NODE=M004R43 NODE=M004R43

 $\Gamma(\eta'(958)\gamma)/\Gamma(\eta\gamma)$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{25}/Γ_6</u>
4.77±0.15 OUR FIT					
4.78±0.20 OUR AVERAGE					
4.77±0.09±0.19	3407	AMBROSINO 07A	KLOE	1.02 $e^+ e^- \rightarrow \pi^+ \pi^- 7\gamma$	NODE=M004R34 NODE=M004R34
4.70±0.47±0.31	120	74 ALOISIO 02E	KLOE	1.02 $e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$	
6.5 $^{+1.7}_{-1.5}$ ±0.8	21	AKHMETSHIN 00B	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.5 $^{+5.2}_{-4.0}$ ±1.4	6	75 AKHMETSHIN 97B	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$	

 $\Gamma(\eta\pi^0\pi^0\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{26}/Γ</u>
<2	90	AULCHENKO 98	SND	$e^+ e^- \rightarrow 7\gamma$	NODE=M004R36 NODE=M004R36

 $\Gamma(\mu^+\mu^-\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{27}/Γ</u>
1.43±0.45±0.14	27188	47 AKHMETSHIN 99B	CMD2	$e^+ e^- \rightarrow \mu^+ \mu^- \gamma$	NODE=M004R35 NODE=M004R35
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.3 ±1.0	824±33	76 AKHMETSHIN 97C	CMD2	$e^+ e^- \rightarrow \mu^+ \mu^- \gamma$	

 $\Gamma(\rho\gamma\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{28}/Γ</u>
<1.2	90	AULCHENKO 08	CMD2	$\phi \rightarrow \pi^+ \pi^- \gamma\gamma$	NODE=M004R37 NODE=M004R37
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<5	90	AKHMETSHIN 98	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma\gamma$	

 $\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{29}/Γ</u>
< 1.8	90	AKHMETSHIN 00E	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^- \pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 6.1	90	AULCHENKO 08	CMD2	$\phi \rightarrow \eta\pi^+\pi^-$	
<30	90	AKHMETSHIN 98	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma\gamma$	

 $\Gamma(\eta\mu^+\mu^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_{30}/Γ</u>
<9.4	90	AKHMETSHIN 01	CMD2	$e^+ e^- \rightarrow \eta e^+ e^-$	NODE=M004R45 NODE=M004R45
1 Combined analysis of the CMD-2 data on $\phi \rightarrow K^+ K^-$, $K_S^0 K_L^0$, $\pi^+ \pi^- \pi^0$, $\eta\gamma$ assuming that the sum of their branching fractions is 0.99741 ± 0.00007 .					
2 Using $B(\phi \rightarrow e^+ e^-) = (2.93 \pm 0.14) \times 10^{-4}$.					
3 Theoretical analysis of BRAMON 00 taking into account phase-space difference, electromagnetic radiative corrections, as well as isospin breaking, predicts 0.62. FLOREZ-BAEZ 08 predicts 0.63 considering also structure-dependent radiative corrections. FISCHBACH 02 calculates additional corrections caused by the close threshold and predicts 0.68. See also BENAYOUN 01 and DUBYNSKIY 07. BENAYOUN 12 obtains 0.71 ± 0.01 in the HLS model.					
4 Using $B(\phi \rightarrow e^+ e^-) = (2.99 \pm 0.08) \times 10^{-4}$.					
5 Using $\Gamma(\phi) = 4.1$ MeV. If interference between the $\rho\pi$ and 3π modes is neglected, the fraction of the $\rho\pi$ is more than 80% at the 90% confidence level.					
6 From a fit without limitations on charged and neutral ρ masses and widths.					
7 Adding the direct and $\omega\pi$ contributions and considering the interference between the $\rho\pi$ and $\pi^+ \pi^- \pi^0$.					
8 Neglecting the interference between the $\rho\pi$ and $\pi^+ \pi^- \pi^0$.					
9 Using $B(\phi \rightarrow e^+ e^-) = (2.99 \pm 0.08) \times 10^{-4}$ and $B(\eta \rightarrow 3\pi^0) = (32.2 \pm 0.4) \times 10^{-2}$.					
10 From $\pi^+ \pi^- \pi^0$ decay mode of η .					
11 From 2γ decay mode of η .					
12 From $3\pi^0$ decay mode of η .					

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NODE=M004R43NODE=M004R34
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NODE=M004R11;LINKAGE=C

- 13 ACHASOV 07B reports $[\Gamma(\phi(1020) \rightarrow \eta\gamma)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow e^+e^-)] = (4.050 \pm 0.067 \pm 0.118) \times 10^{-6}$ which we divide by our best value $B(\phi(1020) \rightarrow e^+e^-) = (2.954 \pm 0.030) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Supersedes ACHASOV 00D and ACHASOV 06A.
- 14 Using $B(\phi \rightarrow e^+e^-) = (2.98 \pm 0.04) \times 10^{-4}$ and $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.
- 15 Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.
- 16 Using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$ and $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.
- 17 The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively).
- 18 From the $\eta \rightarrow 2\gamma$ decay and using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- 19 From $\pi^+\pi^-\pi^0$ decay mode of η and using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- 20 Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution.
- 21 Using $B(\phi \rightarrow e^+e^-) = (2.98 \pm 0.04) \times 10^{-4}$.
- 22 Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$.
- 23 From the $\pi^0 \rightarrow 2\gamma$ decay and using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- 24 From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of K^+K^- , $K_S K_L$, $\pi^+\pi^-\pi^0$, and $\eta\gamma$ decays modes and using ACHASOV 00B for the $\eta\gamma$ decay mode.
- 25 Using total width 4.2 MeV. They detect 3π mode and observe significant interference with ω tail. This is accounted for in the result quoted above.
- 26 Neglecting interference between resonance and continuum.
- 27 Using $B(\phi \rightarrow e^+e^-) = (2.91 \pm 0.07) \times 10^{-4}$.
- 28 Recalculated by us using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- 29 Using $B(\eta \rightarrow \gamma\gamma) = (39.25 \pm 0.32)\%$, $B(\phi \rightarrow \eta\gamma) = (1.26 \pm 0.06)\%$, and $B(\phi \rightarrow e^+e^-) = (3.00 \pm 0.06) \times 10^{-4}$.
- 30 The average of the branching ratios separately obtained from the $\eta \rightarrow \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$ decays.
- 31 From $\eta \rightarrow \gamma\gamma$ decays and using $B(\eta \rightarrow \gamma\gamma) = (39.33 \pm 0.25) \times 10^{-2}$, $B(\eta \rightarrow \pi^+\pi^-\gamma) = (4.75 \pm 11) \times 10^{-2}$, and $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
- 32 From $\eta \rightarrow 3\pi^0$ decays and using $B(\pi^0 \rightarrow \gamma\gamma) = (98.798 \pm 0.033) \times 10^{-2}$, $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$, $B(\eta \rightarrow \pi^+\pi^-\gamma) = (4.75 \pm 0.11) \times 10^{-2}$, and $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
- 33 From $\eta \rightarrow \pi^+\pi^-\pi^0$ decays and using $B(\pi^0 \rightarrow \gamma\gamma) = (98.798 \pm 0.033) \times 10^{-2}$, $B(\pi^0 \rightarrow e^+e^-\gamma) = (1.198 \pm 0.032) \times 10^{-2}$, $B(\eta \rightarrow \pi^+\pi^-\pi^0) = (23.0 \pm 0.4) \times 10^{-2}$, $B(\phi \rightarrow \pi^+\pi^-\pi^0) = (15.5 \pm 0.6) \times 10^{-2}$, and $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
- 34 Using the 1996 and 1998 data.
- 35 $(2.3 \pm 0.3)\%$ correction for other decay modes of the $\omega(782)$ applied.
- 36 Not independent of the corresponding $\Gamma(\omega\pi^0) \times \Gamma(e^+e^-) / \Gamma_{\text{total}}^2$.
- 37 Using the 1996 data.
- 38 Using the 1998 data.
- 39 Supersedes AKHMETSHIN 97C.
- 40 For $E_\gamma > 20$ MeV and assuming that $B(\phi(1020) \rightarrow f_0(980)\gamma)$ is negligible. Supersedes AKHMETSHIN 97C.
- 41 For $E_\gamma > 20$ MeV and assuming that $B(\phi(1020) \rightarrow f_0(980)\gamma)$ is negligible.
- 42 Obtained by the authors taking into account the $\pi^+\pi^-$ decay mode. Includes a component due to $\pi\pi$ production via the $f_0(500)$ meson. Supersedes ALOISIO 02D.
- 43 From the combined fit of the photon spectra in the reactions $e^+e^- \rightarrow \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
- 44 From the negative interference with the $f_0(500)$ meson of AITALA 01B using the ACHASOV 89 parameterization for the $f_0(980)$, a Breit-Wigner for the $f_0(500)$, and ACHASOV 01F for the $\rho\pi$ contribution. Superseded by AMBROSINO 07.
- 45 Assuming that the $\pi^0\pi^0\gamma$ final state is completely determined by the $f_0\gamma$ mechanism, neglecting the decay $B(\phi \rightarrow K\bar{K}\gamma)$ and using $B(f_0 \rightarrow \pi^+\pi^-) = 2B(f_0 \rightarrow \pi^0\pi^0)$.
- 46 Using the value $B(\phi \rightarrow \eta\gamma) = (1.338 \pm 0.053) \times 10^{-2}$.
- 47 For $E_\gamma > 20$ MeV. Supersedes AKHMETSHIN 97C.
- 48 Neglecting other intermediate mechanisms ($\rho\pi$, $\sigma\gamma$).
- 49 A narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
- 50 For destructive interference with the Bremsstrahlung process
- 51 For constructive interference with the Bremsstrahlung process
- 52 Supersedes ALOISIO 02D.
- 53 Supersedes ACHASOV 98I. Excluding $\omega\pi^0$.
- 54 Using various branching ratios from the 2000 Edition of this Review (PDG 00).
- 55 Using $B(\pi^0 \rightarrow \gamma\gamma) = 0.98798 \pm 0.00032$, $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$, and $B(\eta \rightarrow \pi^+\pi^-\gamma) = (4.75 \pm 0.11) \times 10^{-2}$.
- 56 Combined results of $\eta \rightarrow \gamma\gamma$ and $\eta \rightarrow \pi^+\pi^-\pi^0$ decay modes measurements.
- 57 From the decay mode $\eta \rightarrow \gamma\gamma$.

NODE=M004R11;LINKAGE=AO

NODE=M004R11;LINKAGE=AH

NODE=M004R11;LINKAGE=AK

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- 58 From the decay mode $\eta \rightarrow \pi^+ \pi^- \pi^0$.
 59 Supersedes ACHASOV 98B.
 60 Using $B(\phi \rightarrow \eta\gamma) = (1.304 \pm 0.025)\%$, $B(\eta \rightarrow 3\pi^0) = (32.56 \pm 0.23)\%$, and $B(\eta \rightarrow \gamma\gamma) = (39.31 \pm 0.20)\%$.
 61 Using $B(\phi \rightarrow \eta\gamma) = (1.304 \pm 0.025)\%$, $B(\eta \rightarrow 3\pi^0) = (32.56 \pm 0.23)\%$, and $B(\eta \rightarrow \pi^+ \pi^- \pi^0) = (22.73 \pm 0.28)\%$.
 62 Using $M_{a_0(980)} = 984.8$ MeV and assuming $a_0(980)\gamma$ dominance.
 63 Assuming $a_0(980)\gamma$ dominance in the $\eta\pi^0\gamma$ final state.
 64 Using data of ACHASOV 00F.
 65 Using results of ALOISIO 02D and assuming that $f_0(980)$ decays into $\pi\pi$ only and $a_0(980)$ into $\eta\pi$ only.
 66 AMBROSINO 07A reports $[\Gamma(\phi(1020) \rightarrow \eta'(958)\gamma)/\Gamma_{\text{total}}] / [B(\phi(1020) \rightarrow \eta\gamma)] = (4.77 \pm 0.09 \pm 0.19) \times 10^{-3}$ which we multiply by our best value $B(\phi(1020) \rightarrow \eta\gamma) = (1.309 \pm 0.024) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
 67 Averaging AULCHENKO 03B with AULCHENKO 99.
 68 Using $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033)\%$.
 69 Using the value $B(\phi \rightarrow \eta\gamma) = (1.26 \pm 0.06) \times 10^{-2}$.
 70 Using $B(\phi \rightarrow K_L^0 K_S^0) = (33.8 \pm 0.6)\%$.
 71 Averaging AKHMETSHIN 00B with AKHMETSHIN 00F.
 72 Using the value $B(\eta' \rightarrow \eta\pi^+\pi^-) = (43.7 \pm 1.5) \times 10^{-2}$ and $B(\eta \rightarrow \gamma\gamma) = (39.25 \pm 0.31) \times 10^{-2}$.
 73 Using various branching ratios of K_S^0 , K_L^0 , η , η' from the 2000 edition (The European Physical Journal C15 1 (2000)) of this Review.
 74 From the decay mode $\eta' \rightarrow \eta\pi^+\pi^-$, $\eta \rightarrow \gamma\gamma$.
 75 Superseded by AKHMETSHIN 00B.
 76 For $E_\gamma > 20$ MeV.

Lepton Family number (LF) violating modes

$\Gamma(e^\pm \mu^\mp)/\Gamma_{\text{total}}$					Γ_{31}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<2 \times 10^{-6}$	90	ACHASOV	10A SND	$e^+ e^- \rightarrow e^\pm \mu^\mp$	

$\pi^+ \pi^- \pi^0 / \rho\pi$ AMPLITUDE RATIO a_1 IN DECAY OF $\phi \rightarrow \pi^+ \pi^- \pi^0$

NIECKNIG 12 describes final-state interactions between the three pions in a dispersive framework using data on the $\pi\pi$ P -wave scattering phase shift.

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
9.1±1.2 OUR AVERAGE					
10.1±4.4±1.7	80k	1	AKHMETSHIN 06	CMD2	$1.017 - 1.021 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
9.0±1.1±0.6	1.98M	2,3	ALOISIO 03	KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$-6 < a_1 < 6$	500k	3	ACHASOV 02	SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$-16 < a_1 < 11$	90	9.8k	1,4 AKHMETSHIN 98	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma\gamma$

1 Dalitz plot analysis taking into account interference between the contact and $\rho\pi$ amplitudes.

2 From a fit without limitations on charged and neutral ρ masses and widths.

3 Recalculated by us to match the notations of AKHMETSHIN 98.

4 Assuming zero phase for the contact term.

$\phi(1020)$ REFERENCES

BENAYOUN 12	EPJ C72 1848	M. Benayoun <i>et al.</i>
NIECKNIG 12	EPJ C72 2014	F. Niecknig, B. Kubis, S.P. Schneider (BONN)
AKHMETSHIN 11	PL B695 412	R. Akhmetshin <i>et al.</i> (CMD2 Collab.)
ACHASOV 10A	PR D81 057102	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)
BENAYOUN 10	EPJ C65 211	M. Benayoun <i>et al.</i>
AMBROSINO 09C	PL B679 10	F. Ambrosino <i>et al.</i> (KLOE Collab.)
AMBROSINO 09F	PL B681 5	F. Ambrosino <i>et al.</i> (KLOE Collab.)
AKHMETSHIN 08	PL B669 217	R.R. Akhmetshin <i>et al.</i> (CMD-2 Collab.)
AMBROSINO 08G	PL B669 223	F. Ambrosino <i>et al.</i> (KLOE Collab.)
AULCHENKO 08	JETPL 88 85	V. Aulchenko <i>et al.</i> (CMD-2 Collab.)
		Translated from ZETFP 88 93.

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 NODE=M004D1;LINKAGE=KL

NODE=M004

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 REFID=52572
 REFID=52573
 REFID=52268

FLOREZ-BAEZ	08	PR D78 077301	F.V. Florez-Baez, G. Lopez Castro	REFID=52584
ACHASOV	07B	PR D76 077101	M.N. Achasov <i>et al.</i> (SND Collab.)	REFID=51942
AMBROSINO	07	EPJ C49 473	F. Ambrosino <i>et al.</i> (KLOE Collab.)	REFID=51616
AMBROSINO	07A	PL B648 267	F. Ambrosino <i>et al.</i> (KLOE Collab.)	REFID=51646
DUBYNISKIY	07	PR D75 113001	S. Dubynskiy <i>et al.</i>	REFID=51719
ACHASOV	06A	PR D74 014016	M.N. Achasov <i>et al.</i> (SND Collab.)	REFID=51133
AKHMETSHIN	06	PL B642 203	R.R. Akhmetshin <i>et al.</i> (CMD-2 Collab.)	REFID=51465
AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=50330
AMBROSINO	05	PL B608 199	F. Ambrosino <i>et al.</i> (KLOE Collab.)	REFID=50453
AUBERT,B	05J	PR D72 052008	B. Aubert <i>et al.</i> (BABAR Collab.)	REFID=50824
AKHMETSHIN	04	PL B578 285	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=49609
AUBERT,B	04N	PR D70 072004	B. Aubert <i>et al.</i> (BABAR Collab.)	REFID=50184
ALOISIO	03	PL B561 55	A. Aloisio <i>et al.</i> (KLOE Collab.)	REFID=49404
AULCHENKO	03B	JETP 97 24	V.M. Aulchenko <i>et al.</i> (Novosibirsk SND Collab.)	REFID=49613
		Translated from ZETFP 124 28.		
ACHASOV	02	PR D65 032002	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=48549
ACHASOV	02D	JETPL 75 449	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=48814
		Translated from ZETFP 75 539.		
ALOISIO	02C	PL B536 209	A. Aloisio <i>et al.</i> (KLOE Collab.)	REFID=48823
ALOISIO	02D	PL B537 21	A. Aloisio <i>et al.</i> (KLOE Collab.)	REFID=48824
ALOISIO	02E	PL B541 45	A. Aloisio <i>et al.</i> (KLOE Collab.)	REFID=48825
FISCHBACH	02	PL B526 355	E. Fischbach, A.W. Overhauser, B. Woodahl	REFID=48575
GOKALP	02	JPG 28 2783	A. Gokalp <i>et al.</i>	REFID=49167
ACHASOV	01B	PL B504 275	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=48111
ACHASOV	01E	PR D63 072002	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=48311
ACHASOV	01F	PR D63 094007	N.N. Achasov, V.V. Gubin (Novosibirsk SND Collab.)	REFID=48312
ACHASOV	01G	PRL 86 1698	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=48315
AITALA	01B	PRL 86 770	E.M. Aitala <i>et al.</i> (FNAL E791 Collab.)	REFID=48005
AKHMETSHIN	01	PL B501 191	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=48110
AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=48167
AKHMETSHIN	01C	PL B503 237	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=48323
BENAYOUN	01	EPJ C22 503	M. Benayoun, H.B. O'Connell	REFID=48570
ACHASOV	00	EPJ C12 25	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47417
ACHASOV	00B	JETP 90 17	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47425
		Translated from ZETFP 117 22.		
ACHASOV	00C	PL B474 188	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47431
ACHASOV	00D	JETPL 72 282	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47882
		Translated from ZETFP 72 411.		
ACHASOV	00E	NP B569 158	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47927
ACHASOV	00F	PL B479 53	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47928
ACHASOV	00H	PL B485 349	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47930
AKHMETSHIN	00B	PL B473 337	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47422
AKHMETSHIN	00E	PL B491 81	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47936
AKHMETSHIN	00F	PL B494 26	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47937
AULCHENKO	00A	JETP 90 927	V.M. Aulchenko <i>et al.</i> (Novosibirsk SND Collab.)	REFID=47953
		Translated from ZETFP 117 1067.		
BRAMON	00	PL B486 406	A. Bramon <i>et al.</i>	REFID=47969
PDG	00	EPJ C15 1	D.E. Groom <i>et al.</i>	REFID=47469
ACHASOV	99	PL B449 122	M.N. Achasov <i>et al.</i>	REFID=46896
ACHASOV	99C	PL B456 304	M.N. Achasov <i>et al.</i>	REFID=46939
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47392
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47393
AKHMETSHIN	99D	PL B466 385	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47397
Also		PL B508 217 (errat)	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=48328
AKHMETSHIN	99F	PL B460 242	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=47473
AULCHENKO	99	JETPL 69 97	V.M. Aulchenko <i>et al.</i>	REFID=46920
		Translated from ZETFP 69 87.		
ACHASOV	99B	PL B438 441	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=46317
ACHASOV	99F	JETPL 68 573	M.N. Achasov <i>et al.</i> (Novosibirsk SND Collab.)	REFID=46321
ACHASOV	98I	PL B440 442	M.N. Achasov <i>et al.</i>	REFID=46600
AKHMETSHIN	98	PL B434 426	R.R. Akhmetshin <i>et al.</i> (CMD-2 Collab.)	REFID=46325
AULCHENKO	98	PL B436 199	V.M. Aulchenko <i>et al.</i> (Novosibirsk SND Collab.)	REFID=46336
BARBERIS	98	PL B432 436	D. Barberis <i>et al.</i> (Omega Expt.)	REFID=46344
AKHMETSHIN	97B	PL B415 445	R.R. Akhmetshin <i>et al.</i> (NOVO, BOST, PIT+) (NOVO)	REFID=45801
AKHMETSHIN	97C	PL B415 452	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=45802
BENAYOUN	96	ZPHY C72 221	M. Benayoun <i>et al.</i> (IPNP, NOVO)	REFID=45753
AKHMETSHIN	95	PL B364 199	R.R. Akhmetshin <i>et al.</i> (Novosibirsk CMD-2 Collab.)	REFID=44617
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky <i>et al.</i> (NOVO)	REFID=41369
ACHASOV	89	NP B315 465	N.N. Achasov, V.N. Ivanchenko	REFID=48021
DOLINSKY	89	ZPHY C42 511	S.I. Dolinsky <i>et al.</i> (NOVO)	REFID=41003
BARKOV	88	SJNP 47 248	L.M. Barkov <i>et al.</i> (NOVO)	REFID=41024
		Translated from YAF 47 393.		
DOLINSKY	88	SJNP 48 277	S.I. Dolinsky <i>et al.</i> (NOVO)	REFID=41022
		Translated from YAF 48 442.		
DRUZHININ	87	ZPHY C37 1	V.P. Druzhinin <i>et al.</i> (NOVO)	REFID=40448
ARMSTRONG	86	PL 166B 245	T.A. Armstrong <i>et al.</i> (ATHU, BARI, BIRM+)	REFID=20563
ATKINSON	86	ZPHY C30 521	M. Atkinson <i>et al.</i> (BONN, CERN, GLAS+)	REFID=20564
BEBEK	86	PR 56 1893	C. Bebek <i>et al.</i> (CLEO Collab.)	REFID=11540
DAVENPORT	86	PR D33 2519	T.F. Davenport (TUFTS, ARIZ, FSU, NDAM+)	REFID=20567
DIJKSTRA	86	ZPHY C31 375	H. Dijkstra <i>et al.</i> (ANIK, BRIS, CERN+)	REFID=20568
FRAME	86	NP B276 667	D. Frame <i>et al.</i> (GLAS)	REFID=20569
GOLUBEV	86	SJNP 44 409	V.B. Golubev <i>et al.</i> (NOVO)	REFID=40449
		Translated from YAF 44 633.		
ALBRECHT	85D	PL 153B 343	H. Albrecht <i>et al.</i> (ARGUS Collab.)	REFID=20562
GOLUBEV	85	SJNP 41 756	V.B. Golubev <i>et al.</i> (NOVO)	REFID=40450
		Translated from YAF 41 1183.		
DRUZHININ	84	PL 144B 136	V.P. Druzhinin <i>et al.</i> (NOVO)	REFID=20561
ARMSTRONG	83B	NP B224 193	T.A. Armstrong <i>et al.</i> (BARI, BIRM, CERN+)	REFID=20558
BARATE	83	PL 121B 449	R. Barate <i>et al.</i> (SACL, LOIC, SHMP, IND)	REFID=12177
KURDADZE	83C	JETPL 38 366	L.M. Kurdadze <i>et al.</i> (NOVO)	REFID=20560
		Translated from ZETFP 38 306.		
ARENTON	82	PR D25 2241	M.W. Arenton <i>et al.</i> (ANL, ILL)	REFID=20556
PELLINEN	82	PS 25 599	A. Pellinen, M. Roos (HELS)	REFID=20557
DAUM	81	PL 100B 439	C. Daum <i>et al.</i> (AMST, BRIS, CERN, CRAC+)	REFID=20552
IVANOV	81	PL 107B 297	P.M. Ivanov <i>et al.</i> (NOVO)	REFID=20553
Also		Private Comm.	S.I. Eidelman (NOVO)	REFID=20554
VASSERMAN	81	PL 99B 62	I.B. Vasserman <i>et al.</i> (NOVO)	REFID=20555
Also		SJNP 35 240	L.M. Kurdadze <i>et al.</i> (NOVO)	REFID=47475
		Translated from YAF 35 352.		

CORDIER	80	NP B172 13	A. Cordier <i>et al.</i>	(LALO)	REFID=20240
CORDIER	79	PL 81B 389	A. Cordier <i>et al.</i>	(LALO)	REFID=20549
BUKIN	78B	SJNP 27 521	A.D. Bokin <i>et al.</i>	(NOVO)	REFID=20545
		Translated from YAF 27 985.			
BUKIN	78C	SJNP 27 516	A.D. Bokin <i>et al.</i>	(NOVO)	REFID=20544
		Translated from YAF 27 976.			
COOPER	78B	NP B146 1	A.M. Cooper <i>et al.</i>	(TATA, CERN, CDEF+)	REFID=20235
LOSTY	78	NP B133 38	M.J. Losty <i>et al.</i>	(CERN, AMST, NIJM+)	REFID=20547
AKERLOF	77	PRL 39 861	C.W. Akerlof <i>et al.</i>	(FNAL, MICH, PURD)	REFID=20534
ANDREWS	77	PRL 38 198	D.E. Andrews <i>et al.</i>	(ROCH)	REFID=20120
BALDI	77	PL 68B 381	R. Baldi <i>et al.</i>	(GEVA)	REFID=20536
CERRADA	77B	NP B126 241	M. Cerrada <i>et al.</i>	(AMST, CERN, NIJM+)	REFID=20537
COHEN	77	PRL 38 269	D. Cohen <i>et al.</i>	(ANL)	REFID=20538
LAVEN	77	NP B127 43	H. Laven <i>et al.</i>	(AACH3, BERL, CERN, LOIC+)	REFID=20541
LYONS	77	NP B125 207	L. Lyons, A.M. Cooper, A.G. Clark	(OXF)	REFID=20232
COSME	76	PL 63B 352	G. Cosme <i>et al.</i>	(ORSAY)	REFID=20529
KALBFLEISCH	76	PR D13 22	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)	REFID=20531
PARROUR	76	PL 63B 357	G. Parrou <i>et al.</i>	(ORSAY)	REFID=20532
PARROUR	76B	PL 63B 362	G. Parrou <i>et al.</i>	(ORSAY)	REFID=20533
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)	REFID=20223
AYRES	74	PRL 32 1463	D.S. Ayres <i>et al.</i>	(ANL)	REFID=20522
BESCH	74	NP B70 257	H.J. Besch <i>et al.</i>	(BONN)	REFID=20523
COSME	74	PL 48B 155	G. Cosme <i>et al.</i>	(ORSAY)	REFID=20525
COSME	74B	PL 48B 159	G. Cosme <i>et al.</i>	(ORSAY)	REFID=20526
DEGROOT	74	NP B74 77	A.J. de Groot <i>et al.</i>	(AMST, NIJM)	REFID=20527
AUGUSTIN	73	PRL 30 462	J.E. Augustin <i>et al.</i>	(ORSAY)	REFID=47515
BALLAM	73	PR D7 3150	J. Ballam <i>et al.</i>	(SLAC, LBL)	REFID=20520
BINNIE	73B	PR D8 2789	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)	REFID=20216
AGUILAR...	72B	PR D6 29	M. Aguilar-Benitez <i>et al.</i>	(BNL)	REFID=20205
ALVENSEB...	72	PRL 28 66	H. Alvensleben <i>et al.</i>	(MIT, DESY)	REFID=20514
BORENSTEIN	72	PR D5 1559	S.R. Borenstein <i>et al.</i>	(BNL, MICH)	REFID=20215
COLLEY	72	NP B50 1	D.C. Colley <i>et al.</i>	(BIRM, GLAS)	REFID=20519
BALAKIN	71	PL 34B 328	V.E. Balakin <i>et al.</i>	(NOVO)	REFID=20507
CHATELUS	71	Thethesis LAL 1247	Y. Chatelus	(STRB)	REFID=20508
Also		PL 32B 416	J.C. Bizot <i>et al.</i>	(ORSAY)	REFID=20501
HAYES	71	PR D4 899	S. Hayes <i>et al.</i>	(CORN)	REFID=20511
STOTTLE...	71	Thesis ORO 2504 170	A.R. Stottlemyer	(UMD)	REFID=20512
BIZOT	70	PL 32B 416	J.C. Bizot <i>et al.</i>	(ORSAY)	REFID=20501
Also		Liverpool Sym. 69	J.P. Perez-y-Jorba		REFID=20502
EARLES	70	PRL 25 1312	D.R. Earles <i>et al.</i>	(NEAS)	REFID=20504
LINDSEY	66	PR 147 913	J.S. Lindsey, G. Smith	(LRL)	REFID=20481
LONDON	66	PR 143 1034	G.W. London <i>et al.</i>	(BNL, SYRA) IGJP	REFID=11774
BADIER	65B	PL 17 337	J. Badier <i>et al.</i>	(EPOL, SACL, AMST)	REFID=20253
LINDSEY	65	PRL 15 221	J.S. Lindsey, G.A. Smith	(LRL)	REFID=20478
LINDSEY	65	data included in LINDSEY 66.			
SCHLEIN	63	PRL 10 368	P.E. Schlein <i>et al.</i>	(UCLA) IGJP	REFID=20474

 $h_1(1170)$ $I^G(J^{PC}) = 0^-(1^{+-})$ **$h_1(1170)$ MASS**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
-------------	-------------	------	-----	---------

 1170 ± 20 OUR ESTIMATE

• • • We do not use the following data for averages, fits, limits, etc. • • •

1168 ± 4	ANDO	92	SPEC	$8\pi^- p \rightarrow \pi^+\pi^-\pi^0 n$
1166 ± 5 ± 3	1 ANDO	92	SPEC	$8\pi^- p \rightarrow \pi^+\pi^-\pi^0 n$
1190 ± 60	2 DANKOWY...	81	SPEC 0	$8\pi p \rightarrow 3\pi n$

1 Average and spread of values using 2 variants of the model of BOWLER 75.

2 Uses the model of BOWLER 75.

NODE=M030M

NODE=M030M

→ UNCHECKED ←

OCCUR=2

NODE=M030M;LINKAGE=B

NODE=M030M;LINKAGE=C

NODE=M030W

NODE=M030W

→ UNCHECKED ←

OCCUR=2

NODE=M030W;LINKAGE=B

NODE=M030W;LINKAGE=C

 $h_1(1170)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
-------------	-------------	------	-----	---------

 360 ± 40 OUR ESTIMATE

• • • We do not use the following data for averages, fits, limits, etc. • • •

345 ± 6	ANDO	92	SPEC	$8\pi^- p \rightarrow \pi^+\pi^-\pi^0 n$
375 ± 6 ± 34	3 ANDO	92	SPEC	$8\pi^- p \rightarrow \pi^+\pi^-\pi^0 n$
320 ± 50	4 DANKOWY...	81	SPEC 0	$8\pi p \rightarrow 3\pi n$

3 Average and spread of values using 2 variants of the model of BOWLER 75.

4 Uses the model of BOWLER 75.

h₁(1170) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\rho\pi$	seen

h₁(1170) BRANCHING RATIOS

$\Gamma(\rho\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ/Γ
<u>VALUE</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	ANDO 92	SPEC 8	$\pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$
seen	ATKINSON 84	OMEG 20–70	$\gamma p \rightarrow \pi^+ \pi^- \pi^0 p$
seen	DANKOWY... 81	SPEC 8	$\pi p \rightarrow 3\pi n$

h₁(1170) REFERENCES

ANDO 92	PL B291 496	A. Ando <i>et al.</i>	(KEK, KYOT, NIRS, SAGA+)
ATKINSON 84	NP B231 15	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
DANKOWY... 81	PRL 46 580	J.A. Dankowich <i>et al.</i>	(TNTD, BNL, CARL+)
BOWLER 75	NP B97 227	M.G. Bowler <i>et al.</i>	(OXFTP, DARE)

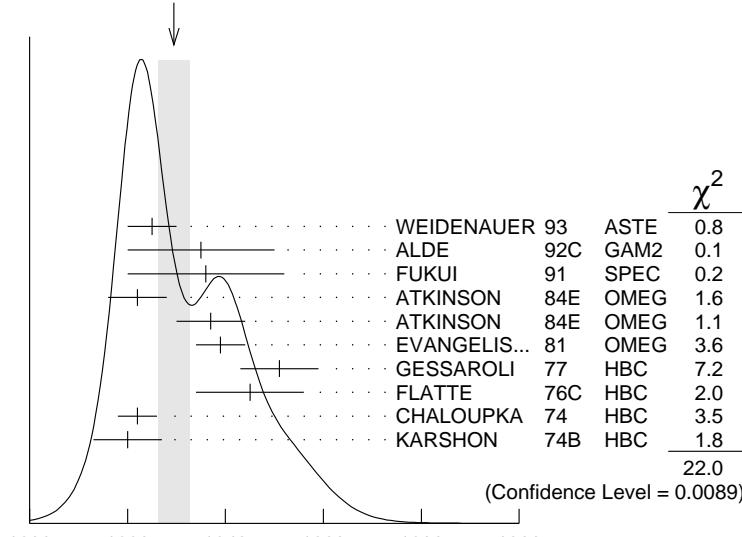
b₁(1235)

$I^G(J^{PC}) = 1^+(1^{+-})$

b₁(1235) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1229.5 ± 3.2 OUR AVERAGE					
		Error includes scale factor of 1.6. See the ideogram below.			
1225 ± 5		WEIDENAUER 93	ASTE		$\bar{p}p \rightarrow 2\pi^+ 2\pi^- \pi^0$
1235 ± 15		ALDE	92C GAM2		$38,100 \pi^- p \rightarrow \omega \pi^0 n$
1236 ± 16		FUKUI	91 SPEC		$8.95 \pi^- p \rightarrow \omega \pi^0 n$
1222 ± 6		ATKINSON	84E OMEG ±		$25–55 \gamma p \rightarrow \omega \pi X$
1237 ± 7		ATKINSON	84E OMEG 0		$25–55 \gamma p \rightarrow \omega \pi X$
1239 ± 5		EVANGELIS...	81 OMEG –		$12 \pi^- p \rightarrow \omega \pi \rho$
1251 ± 8	450	GESELLER	77 HBC –		$11 \pi^- p \rightarrow \pi^- \omega p$
1245 ± 11	890	FLATTE	76C HBC –		$4.2 K^- p \rightarrow \pi^- \omega \Sigma^+$
1222 ± 4	1400	CHALOUPKA	74 HBC –		$3.9 \pi^- p$
1220 ± 7	600	KARSHON	74B HBC +		$4.9 \pi^+ p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1190 ± 10		AUGUSTIN	89 DM2 ±		$e^+ e^- \rightarrow 5\pi$
1213 ± 5		ATKINSON	84C OMEG 0		$20–70 \gamma p$
1271 ± 11		COLLICK	84 SPEC +		$200 \pi^+ Z \rightarrow Z \pi \omega$

WEIGHTED AVERAGE
1229.5±3.2 (Error scaled by 1.6)

***b₁(1235)***

NODE=M030215;NODE=M030

DESIG=1;OUR EST;→ UNCHECKED ←

NODE=M030220

NODE=M030R1
NODE=M030R1

NODE=M030

REFID=43171
REFID=20574
REFID=20572
REFID=20571

NODE=M011

NODE=M011M

NODE=M011M

OCCUR=2

$b_1(1235)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
142± 9 OUR AVERAGE		Error includes scale factor of 1.2.			
113±12		WEIDENAUER 93	ASTE		$\bar{p}p \rightarrow 2\pi^+ 2\pi^- \pi^0$
160±30		ALDE	92C GAM2		$38,100 \pi^- p \rightarrow \omega \pi^0 n$
151±31		FUKUI	91	SPEC	$8.95 \pi^- p \rightarrow \omega \pi^0 n$
170±15		EVANGELIS...	81	OMEG	—
170±50	225	BALTAY	78B HBC	+	$12 \pi^- p \rightarrow \omega \pi p$
155±32	450	GESELLER	77	HBC	—
182±45	890	FLATTE	76C HBC	—	$4.2 K^- p \rightarrow \pi^- \omega \Sigma^+$
135±20	1400	CHALOUPKA	74	HBC	—
156±22	600	KARSHON	74B HBC	+	$3.9 \pi^- p$
• • •	We do not use the following data for averages, fits, limits, etc. • • •				
210±19		AUGUSTIN	89	DM2	± $e^+ e^- \rightarrow 5\pi$
231±14		ATKINSON	84C OMEG	0	20–70 γp
232±29		COLLICK	84	SPEC	+
					$200 \pi^+ Z \rightarrow Z \pi \omega$

NODE=M011W

NODE=M011W

 $b_1(1235)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 \omega \pi$ [D/S amplitude ratio = 0.277 ± 0.027]	dominant	
$\Gamma_2 \pi^\pm \gamma$	$(1.6 \pm 0.4) \times 10^{-3}$	
$\Gamma_3 \eta \rho$	seen	
$\Gamma_4 \pi^+ \pi^+ \pi^- \pi^0$	< 50 %	84%
$\Gamma_5 K^*(892)^\pm K^\mp$	seen	
$\Gamma_6 (K\bar{K})^\pm \pi^0$	< 8 %	90%
$\Gamma_7 K_S^0 K_L^0 \pi^\pm$	< 6 %	90%
$\Gamma_8 K_S^0 K_S^0 \pi^\pm$	< 2 %	90%
$\Gamma_9 \phi \pi$	< 1.5 %	84%

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 DESIG=73;OUR EST;→ UNCHECKED ←
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 $b_1(1235)$ PARTIAL WIDTHS

$\Gamma(\pi^\pm \gamma)$	Γ_2
VALUE (keV)	COLLICK 84 SPEC + $200 \pi^+ Z \rightarrow Z \pi \omega$

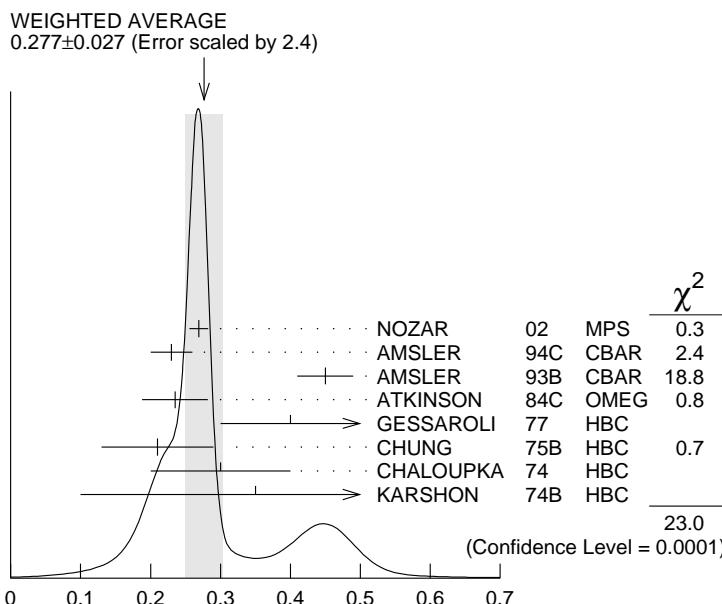
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NODE=M011W3 **$b_1(1235)$ D-wave/S-wave AMPLITUDE RATIO
IN DECAY OF $b_1(1235) \rightarrow \omega \pi$**

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
0.277±0.027 OUR AVERAGE		Error includes scale factor of 2.4. See the ideogram below.			
0.269±0.009±0.010		NOZAR	02 MPS	—	$18 \pi^- p \rightarrow \omega \pi^- p$
0.23 ±0.03		AMSLER	94C CBAR		$0.0 \bar{p}p \rightarrow \omega \eta \pi^0$
0.45 ±0.04		AMSLER	93B CBAR		$0.0 \bar{p}p \rightarrow \omega \pi^0 \pi^0$
0.235±0.047		ATKINSON	84C OMEG		20–70 γp
0.4 +0.1 —0.1		GESELLER	77 HBC	—	$11 \pi^- p \rightarrow \pi^- \omega p$
0.21 ±0.08		CHUNG	75B HBC	+	$7.1 \pi^+ p$
0.3 ±0.1		CHALOUPKA	74 HBC	—	$3.9\text{--}7.5 \pi^- p$
0.35 ±0.25	600	KARSHON	74B HBC	+	$4.9 \pi^+ p$

NODE=M011DS

NODE=M011DS



$b_1(1235)$ D-wave/S-wave amplitude ratio in decay of $b_1(1235) \rightarrow \omega\pi$

**$b_1(1235)$ D-wave/S-wave AMPLITUDE PHASE DIFFERENCE
IN DECAY OF $b_1(1235) \rightarrow \omega\pi$**

NODE=M011PH

VALUE (°)	DOCUMENT ID	TECN	CHG	COMMENT
10.5±2.4±3.9	NOZAR	02	MPS	- 18 $\pi^- p \rightarrow \omega\pi^- p$

NODE=M011PH

$b_1(1235)$ BRANCHING RATIOS

$\Gamma(\eta\rho)/\Gamma(\omega\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT
<0.10	ATKINSON	84D	OMEV 20–70 γp

Γ_3/Γ_1

NODE=M011R9
NODE=M011R9

$\Gamma(\pi^+\pi^+\pi^-\pi^0)/\Gamma(\omega\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT
<0.5	ABOLINS	63	HBC + 3.5 $\pi^+ p$

Γ_4/Γ_1

NODE=M011R1
NODE=M011R1

$\Gamma(K^*(892)^\pm K^\mp)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
seen	¹ ABLIKIM	10E	BES2 $J/\psi \rightarrow K^\pm K_S^0 \pi^\mp \pi^0$

Γ_5/Γ_1

NODE=M011R10
NODE=M011R10

¹ From a fit including ten additional resonances and energy-independent Breit-Wigner width.

$\Gamma((K\bar{K})^\pm\pi^0)/\Gamma(\omega\pi)$

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<0.08	90	BALTAY	67	HBC	± 0.0 $\bar{p}p$

Γ_6/Γ_1

NODE=M011R6
NODE=M011R6

$\Gamma(K_S^0 K_L^0 \pi^\pm)/\Gamma(\omega\pi)$

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<0.06	90	BALTAY	67	HBC	± 0.0 $\bar{p}p$

Γ_7/Γ_1

NODE=M011R8
NODE=M011R8

$\Gamma(K_S^0 K_S^0 \pi^\pm)/\Gamma(\omega\pi)$

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<0.02	90	BALTAY	67	HBC	± 0.0 $\bar{p}p$

Γ_8/Γ_1

NODE=M011R7
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$\Gamma(\phi\pi)/\Gamma(\omega\pi)$

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<0.004	95	VIKTOROV	96	SPEC 0	32.5 $\pi^- p \rightarrow K^+ K^- \pi^0 n$

Γ_9/Γ_1

NODE=M011R4
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.04	95	BIZZARRI	69	HBC	± 0.0 $\bar{p}p$
<0.015		DAHL	67	HBC	1.6–4.2 $\pi^- p$

b₁(1235) REFERENCES

ABLIKIM	10E	PL B693 88	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53361
NOZAR	02	PL B541 35	M. Nozar <i>et al.</i>		REFID=48850
VIKTOROV	96	PAN 59 1184	V.A. Viktorov <i>et al.</i>	(SERP)	REFID=45203
		Translated from YAF 59 1239.			
AMSLER	94C	PL B327 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44091
AMSLER	93B	PL B311 362	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43602
WEIDENAUER	93	ZPHY C59 387	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)	REFID=43585
ALDE	92C	ZPHY C54 553	D.M. Alde <i>et al.</i>	(BELG, SERP, KEK, LANL+)	REFID=41859
FUKUI	91	PL B257 241	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)	REFID=41581
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41004
ATKINSON	84C	NP B243 1	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+) JP	REFID=20625
ATKINSON	84D	NP B242 269	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=20623
ATKINSON	84E	PL 138B 459	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=20624
COLLICK	84	PRL 53 2374	B. Collick <i>et al.</i>	(MINN, ROCH, FNAL)	REFID=20626
EVANGELIS...	81	NP B178 197	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)	REFID=20462
BALTAY	78B	PR D17 62	C. Baltay <i>et al.</i>	(COLU, BING)	REFID=21265
GES SAROLI	77	NP B126 382	R. Gessaroli <i>et al.</i>	(BGNA, FIRZ, GENO+) JP	REFID=20230
FLATTE	76C	PL 64B 225	S.M. Flatte <i>et al.</i>	(CERN, AMST, NIJM+) JP	REFID=20615
CHUNG	75B	PR D11 2426	S.U. Chung <i>et al.</i>	(BNL, LBL, UCSC) JP	REFID=20613
CHALOUPKA	74	PL 51B 407	V. Chaloupka <i>et al.</i>	(CERN) JP	REFID=20611
KARSHON	74B	PR D10 3608	U. Karshon <i>et al.</i>	(REHO) JP	REFID=20612
BIZZARRI	69	NP B14 169	R. Bizzarri <i>et al.</i>	(CERN, CDEF)	REFID=20171
BALTAY	67	PRL 18 93	C. Baltay <i>et al.</i>	(COLU)	REFID=20159
DAHL	67	PR 163 1377	O.I. Dahl <i>et al.</i>	(LRL)	REFID=20321
ABOLINS	63	PRL 11 381	M.A. Abolins <i>et al.</i>	(UCSD)	REFID=20006

a₁(1260)

$$I^G(J^{PC}) = 1^-(1^{++})$$

See also our review under the $a_1(1260)$ in PDG 06, Journal of Physics, G **33** 1 (2006).

a₁(1260) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1230±40 OUR ESTIMATE					
1255± 6⁺⁷₋₁₇	420k	ALEKSEEV	10	COMP 190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1243±12±20		1 AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \rho^0 \rho^\pm \pi^\mp \gamma$	
1230–1270	6360	2 LINK	07A FOCS	$D^0 \rightarrow \pi^- \pi^+ \pi^- \pi^+$	
1203± 3		3 GOMEZ-DUM..04	RVUE	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu_\tau$	
1330±24	90k	4 SALVINI	04 OBLX	$\bar{p}p \rightarrow 2\pi^+ 2\pi^-$	
1331±10± 3	37k	4 ASNER	00 CLE2	$10.6 e^+ e^- \rightarrow \tau^+ \tau^-, \tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	
1255± 7± 6	5904	5 ABREU	98G DLPH	$e^+ e^-$	
1207± 5± 8	5904	6 ABREU	98G DLPH	$e^+ e^-$	OCCUR=2
1196± 4± 5	5904	7,8 ABREU	98G DLPH	$e^+ e^-$	OCCUR=3
1240±10		BARBERIS	98B	$450 pp \rightarrow p_f \pi^+ \pi^- \pi^0 p_s$	
1262± 9± 7		5,9 ACKERSTAFF	97R OPAL	$E_{cm}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$	
1210± 7± 2		6,9 ACKERSTAFF	97R OPAL	$E_{cm}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$	OCCUR=2
1211± 7 ⁺⁵⁰ ₋₀		6 ALBRECHT	93C ARG	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1121± 8		10 ANDO	92 SPEC	$8 \pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$	
1242±37		11 IVANOV	91 RVUE	$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1260±14		12 IVANOV	91 RVUE	$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$	OCCUR=2
1250± 9		13 IVANOV	91 RVUE	$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$	OCCUR=3
1208±15		ARMSTRONG	90 OMEG	$300.0 pp \rightarrow pp \pi^+ \pi^- \pi^0$	
1220±15		14 ISGUR	89 RVUE	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1260±25		15 BOWLER	88 RVUE		
1166±18±11		BAND	87 MAC	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1164±41±23		BAND	87 MAC	$\tau^+ \rightarrow \pi^+ \pi^0 \pi^0 \nu$	OCCUR=2
1250±40		14 TORNQVIST	87 RVUE		
1046±11		ALBRECHT	86B ARG	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1056±20±15		RUCKSTUHL	86 DLCO	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1194±14±10		SCHMIDKE	86 MRK2	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$	
1255±23		BELLINI	85 SPEC	$40 \pi^- A \rightarrow \pi^- \pi^+ \pi^- A$	
1240±80		16 DANKOWY...	81 SPEC	$8.45 \pi^- p \rightarrow n 3\pi$	
1280±30		16 DAUM	81B CNTR	$63.94 \pi^- p \rightarrow p 3\pi$	
1041±13		17 GAVILLET	77 HBC	$4.2 K^- p \rightarrow \Sigma 3\pi$	

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- 1 The $\rho^\pm \pi^\mp$ state can be also due to the $\pi(1300)$.
 2 Using the Breit-Wigner parameterization; strong correlation between mass and width.
 3 Using the data of BARATE 98R.
 4 From a fit to the 3π mass spectrum including the $K\bar{K}^*(892)$ threshold.
 5 Uses the model of KUHN 90.
 6 Uses the model of ISGUR 89.
 7 Includes the effect of a possible a'_1 state.
 8 Uses the model of FEINDT 90.
 9 Supersedes AKERS 95P.
 10 Average and spread of values using 2 variants of the model of BOWLER 75.
 11 Reanalysis of RUCKSTUHL 86.
 12 Reanalysis of SCHMIDKE 86.
 13 Reanalysis of ALBRECHT 86B.
 14 From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
 15 From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
 16 Uses the model of BOWLER 75.
 17 Produced in K^- backward scattering.

$a_1(1260)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
250 to 600 OUR ESTIMATE				
367 ± 9 ± 28	420k	ALEKSEEV	10 COMP	190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
410 ± 31 ± 30		18 AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \rho^0 \rho^\pm \pi^\mp \gamma$
520–680	6360	19 LINK	07A FOCS	$D^0 \rightarrow \pi^- \pi^+ \pi^- \pi^+$
480 ± 20		20 GOMEZ-DUM..04	RVUE	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu_\tau$
580 ± 41	90k	31 SALVINI	04 OBLX	$\bar{p}p \rightarrow 2\pi^+ 2\pi^-$
460 ± 85	205	21 DRUTSKOY	02 BELL	$B \rightarrow D(*) K^- K^{*0}$
814 ± 36 ± 13	37k	22 ASNER	00 CLE2	$10.6 e^+ e^- \rightarrow \tau^+ \tau^-, \tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$
450 ± 50	22k	23 AKHMETSHIN 99E	CMD2	$1.05-1.38 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$
570 ± 10		24 BONDAR	99 RVUE	$e^+ e^- \rightarrow 4\pi, \tau \rightarrow 3\pi\nu_\tau$
587 ± 27 ± 21	5904	25 ABREU	98G DLPH	$e^+ e^-$
478 ± 3 ± 15	5904	26 ABREU	98G DLPH	$e^+ e^-$
425 ± 14 ± 8	5904	27,28 ABREU	98G DLPH	$e^+ e^-$
400 ± 35		29 BARBERIS	98B	$450 pp \rightarrow p_f \pi^+ \pi^- \pi^0 p_s$
621 ± 32 ± 58		25,29 ACKERSTAFF	97R OPAL	$E_{cm}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$
457 ± 15 ± 17		26,29 ACKERSTAFF	97R OPAL	$E_{cm}^{ee} = 88-94, \tau \rightarrow 3\pi\nu$
446 ± 21 ± 140	0	26 ALBRECHT	93C ARG	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
239 ± 11		30 ANDO	92 SPEC	$8 \pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$
266 ± 13 ± 4		30 ANDO	92 SPEC	$8 \pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$
465 ± 228		31 IVANOV	91 RVUE	$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$
298 ± 40		32 IVANOV	91 RVUE	$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$
488 ± 32		33 IVANOV	91 RVUE	$\tau \rightarrow \pi^+ \pi^+ \pi^- \nu$
430 ± 50		34 ARMSTRONG	90 OMEG	$300.0 pp \rightarrow pp \pi^+ \pi^- \pi^0$
420 ± 40		34 ISGUR	89 RVUE	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
396 ± 43		35 BOWLER	88 RVUE	
405 ± 75 ± 25		36 BAND	87 MAC	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
419 ± 108 ± 57		36 BAND	87 MAC	$\tau^+ \rightarrow \pi^+ \pi^0 \pi^0 \nu$
521 ± 27		36 ALBRECHT	86B ARG	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
476 ± 132 ± 54		36 RUCKSTUHL	86 DLCO	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
462 ± 56 ± 30		36 SCHMIDKE	86 MRK2	$\tau^+ \rightarrow \pi^+ \pi^+ \pi^- \nu$
292 ± 40		36 BELLINI	85 SPEC	$40 \pi^- A \rightarrow \pi^- \pi^+ \pi^- A$
380 ± 100		36 DANKOWY...	81 SPEC	$8.45 \pi^- p \rightarrow n3\pi$
300 ± 50		36 DAUM	81B CNTR	$63,94 \pi^- p \rightarrow p3\pi$
230 ± 50		37 GAVILLET	77 HBC	$4.2 K^- p \rightarrow \Sigma 3\pi$

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- 18 The $\rho^\pm \pi^\mp$ state can be also due to the $\pi(1300)$.
 19 Using the Breit-Wigner parameterization; strong correlation between mass and width.
 20 Using the data of BARATE 98R.
 21 From a fit of the $K^- K^{*0}$ distribution assuming $m_{a_1} = 1230$ MeV and purely resonant production of the $K^- K^{*0}$ system.
 22 From a fit to the 3π mass spectrum including the $K\bar{K}^*(892)$ threshold.
 23 Using the $a_1(1260)$ mass of 1230 MeV.
 24 From AKHMETSHIN 99E and ASNER 00 data using the $a_1(1260)$ mass of 1230 MeV.
 25 Uses the model of KUHN 90.
 26 Uses the model of ISGUR 89.
 27 Includes the effect of a possible a'_1 state.
 28 Uses the model of FEINDT 90.
 29 Supersedes AKERS 95P.
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 31 Reanalysis of RUCKSTUHL 86.
 32 Reanalysis of SCHMIDKE 86.
 33 Reanalysis of ALBRECHT 86B.
 34 From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
 35 From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
 36 Uses the model of BOWLER 75.
 37 Produced in K^- backward scattering.

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$a_1(1260)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi^+ \pi^- \pi^0$	
$\Gamma_2 \pi^0 \pi^0 \pi^0$	
$\Gamma_3 (\rho\pi)_S$ -wave	seen
$\Gamma_4 (\rho\pi)_D$ -wave	seen
$\Gamma_5 (\rho(1450)\pi)_S$ -wave	seen
$\Gamma_6 (\rho(1450)\pi)_D$ -wave	seen
$\Gamma_7 \sigma\pi$	seen
$\Gamma_8 f_0(980)\pi$	not seen
$\Gamma_9 f_0(1370)\pi$	seen
$\Gamma_{10} f_2(1270)\pi$	seen
$\Gamma_{11} K\bar{K}^*(892) + \text{c.c.}$	seen
$\Gamma_{12} \pi\gamma$	seen

$a_1(1260)$ PARTIAL WIDTHS

$\Gamma(\pi\gamma)$	Γ_{12}
VALUE (keV)	
640±246	ZIELINSKI 84C SPEC 200 $\pi^+ Z \rightarrow Z3\pi$

D-wave/S-wave AMPLITUDE RATIO IN DECAY OF $a_1(1260) \rightarrow \rho\pi$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.062±0.020 OUR AVERAGE	Error includes scale factor of 2.3. See the ideogram below.		
-0.043±0.009±0.005	LINK 07A FOCS	$D^0 \rightarrow \pi^-\pi^+\pi^-\pi^+$	
-0.14 ± 0.04 ± 0.07	38 CHUNG 02 B852	$18.3 \pi^- p \rightarrow \pi^+\pi^-\pi^- p$	
-0.10 ± 0.02 ± 0.02	39,40 ACKERSTAFF 97R OPAL	$E_{\text{cm}}^{\text{ee}} = 88-94, \tau \rightarrow 3\pi\nu$	
-0.11 ± 0.02	39 ALBRECHT 93C ARG	$\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$	

38 Deck-type background not subtracted.

39 Uses the model of ISGUR 89.

40 Supersedes AKERS 95P.

NODE=M010215;NODE=M010

DESIG=22

DESIG=23

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 DESIG=8;OUR EST; \rightarrow UNCHECKED \leftarrow
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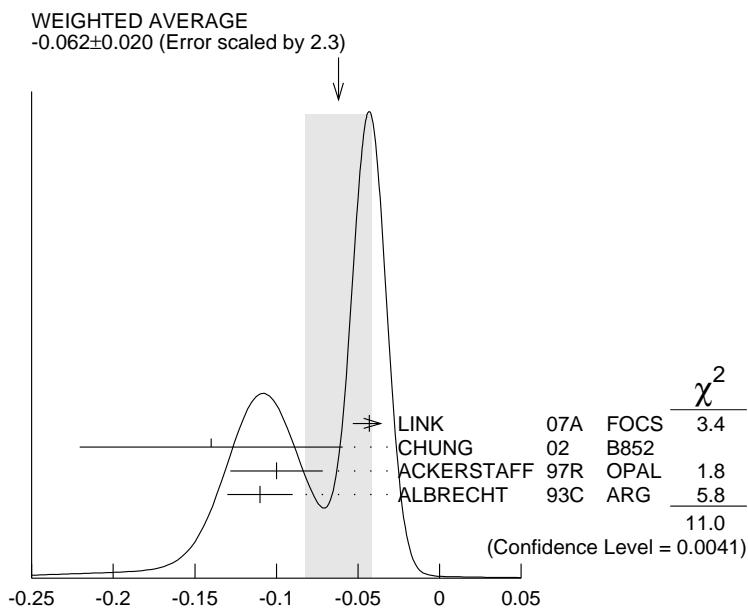
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D-wave/S-wave AMPLITUDE RATIO IN DECAY OF $a_1(1260) \rightarrow \rho\pi$

$a_1(1260)$ BRANCHING RATIOS

$\Gamma((\rho\pi)_S\text{-wave})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
60.19	37k	41 ASNER	00	CLE2 $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	

$\Gamma((\rho\pi)_D\text{-wave})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
1.30±0.60±0.22	37k	41 ASNER	00	CLE2 $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	

$\Gamma((\rho(1450)\pi)_S\text{-wave})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
0.56±0.84±0.32	37k	41,42 ASNER	00	CLE2 $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	

$\Gamma((\rho(1450)\pi)_D\text{-wave})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
2.04±1.20±0.28	37k	41,42 ASNER	00	CLE2 $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	

$\Gamma(\sigma\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
seen		CHUNG	02	B852 $18.3 \pi^- p \rightarrow \pi^+ \pi^- \pi^- p$	
18.76±4.29±1.48	37k	41,43 ASNER	00	CLE2 $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	

$\Gamma(f_0(980)\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_8/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
not seen	37k	ASNER	00	CLE2 $10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$	

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NODE=M010R5NODE=M010R6
NODE=M010R6NODE=M010R7
NODE=M010R7NODE=M010R8
NODE=M010R8NODE=M010R9
NODE=M010R9NODE=M010R10
NODE=M010R10

$\Gamma(f_0(1370)\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$7.40 \pm 2.71 \pm 1.26$	37k	41,44 ASNER	00 CLE2	$10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$

 Γ_9/Γ

NODE=M010R11
NODE=M010R11

 $\Gamma(f_2(1270)\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
$1.19 \pm 0.49 \pm 0.17$	37k	41,45 ASNER	00 CLE2	$10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$

 Γ_{10}/Γ

NODE=M010R12
NODE=M010R12

 $\Gamma(K\bar{K}^*(892)+\text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
2.2 ± 0.5	2255	46 COAN	04 CLEO	$\tau^- \rightarrow K^- \pi^- K^+ \nu_\tau$
8 to 15	205	47 DRUTSKOY	02 BELL	$B \rightarrow D(*) K^- K^{*0}$
$3.3 \pm 0.5 \pm 0.1$	37k	48 ASNER	00 CLE2	$10.6 e^+ e^- \rightarrow \tau^+ \tau^-$, $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$
2.6 ± 0.3	49 BARATE	99R ALEP	$\tau \rightarrow K\bar{K}\pi\nu_\tau$	

 Γ_{11}/Γ

NODE=M010R13
NODE=M010R13

 $\Gamma(\sigma\pi)/\Gamma((\rho\pi)_{S-\text{wave}})$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
0.06 ± 0.05	90k	SALVINI	04 OBLX	$\bar{p}p \rightarrow 2\pi^+ 2\pi^-$
~0.3	28k	AKHMETSHIN	99E CMD2	$1.05 \pm 1.38 e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^-$
0.003 ± 0.003	50 LONGACRE	82 RVUE		

 Γ_7/Γ_3

NODE=M010R4
NODE=M010R4

 $\Gamma(\pi^0\pi^0\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$

VALUE	CL%	DOCUMENT ID	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
<0.008	90	51 BARBERIS	01 $450 pp \rightarrow p_f 3\pi^0 p_s$
41	From a fit to the Dalitz plot.		
42	Assuming for $\rho(1450)$ mass and width of 1370 and 386 MeV respectively.		
43	Assuming for σ mass and width of 860 and 880 MeV respectively.		
44	Assuming for $f_0(1370)$ mass and width of 1186 and 350 MeV respectively.		
45	Assuming for $f_2(1270)$ mass and width of 1275 and 185 MeV respectively.		
46	Using structure functions from KUHN 92 and DECKER 93A and $B(\tau^- \rightarrow K^- \pi^- K^+ \nu_\tau) = (0.155 \pm 0.006 \pm 0.009)\%$ from BRIERE 03.		
47	From a comparison to ALAM 94 assuming purely resonant production of the $K^- K^{*0}$ system.		
48	From a fit to the 3π mass spectrum including the $K\bar{K}^*(892)$ threshold.		
49	Assuming $a_1(1260)$ dominance and taking $B(\tau \rightarrow a_1(1260)\nu_\tau)$ from BUSKULIC 96.		
50	Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from GAVIL-LET 77, DAUM 80, and DANKOWYCH 81.		
51	Inconsistent with observations of $\sigma\pi$, $f_0(1370)\pi$, and $f_2(1270)\pi$ decay modes.		

 Γ_2/Γ_1

NODE=M010R15
NODE=M010R15

 $a_1(1260)$ REFERENCES

ALEKSEEV	10	PRL 104 241803	M.G. Alekseev et al.	(COMPASS Collab.)
AUBERT	07AU	PR D76 092005	B. Aubert et al.	(BABAR Collab.)
LINK	07A	PR D75 052003	J.M. Link et al.	(FNAL FOCUS Collab.)
PDG	06	JPG 33 1	W.-M. Yao et al.	(PDG Collab.)
COAN	04	PRL 92 232001	T.E. Coan et al.	(CLEO Collab.)
GOMEZ-DUM...	04	PR D69 073002	D. Gomez Dumm, A. Pich, J. Portoles	
SALVINI	04	EPJ C35 21	P. Salvini et al.	(OBELIX Collab.)
BRIERE	03	PRC 90 181802	R. A. Briere et al.	(CLEO Collab.)
CHUNG	02	PR D65 072001	S.U. Chung et al.	(BNL E852 Collab.)
DRUTSKOY	02	PL B542 171	A. Drutskoy et al.	(BELLE Collab.)
BARBERIS	01	PL B507 14	D. Barberis et al.	
ASNER	00	PR D61 012002	D.M. Asner et al.	(CLEO Collab.)
AKHMETSHIN	99E	PL B466 392	R.R. Akhmetshin et al.	(Novosibirsk CMD-2 Collab.)
BARATE	99R	EPJ C11 599	R. Barate et al.	(ALEPH Collab.)
BONDAR	99	PL B466 403	A.E. Bondar et al.	(Novosibirsk CMD-2 Collab.)
ABREU	98S	PL B426 411	P. Abreu et al.	(DELPHI Collab.)
BARATE	98R	EPJ C4 409	R. Barate et al.	(ALEPH Collab.)
BARBERIS	98B	PL B422 399	D. Barberis et al.	(WA 102 Collab.)
ACKERSTAFF	97R	ZPHY C75 593	K. Ackerstaff et al.	(OPAL Collab.)
BUSKULIC	96	ZPHY C70 579	D. Buskulic et al.	(ALEPH Collab.)
AKERS	95P	ZPHY C67 45	R. Akers et al.	(OPAL Collab.)
ALAM	94	PR D50 43	M.S. Alam et al.	(CLEO Collab.)

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REFID=53356
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REFID=46147
REFID=46345
REFID=45616
REFID=44588
REFID=44366
REFID=43738

ALBRECHT	93C	ZPHY C58 61	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=43310
DECKER	93A	ZPHY C58 445	R. Decker <i>et al.</i>		REFID=51577
ANDO	92	PL B291 496	A. Ando <i>et al.</i>	(KEK, KYOT, NIRS, SAGA+)	REFID=43171
KUHN	92	ZPHY C56 661	J.H. Kuhn, E. Mirkes		REFID=51576
IVANOV	91	ZPHY C49 563	Y.P. Ivanov, A.A. Osipov, M.K. Volkov	(JINR)	REFID=41750
ARMSTRONG	90	ZPHY C48 213	T.A. Armstrong, M. Benayoun, W. Beusch	(WA76 Coll.)	REFID=41375
FEINDT	90	ZPHY C48 681	M. Feindt	(HAMB)	REFID=45912
KUHN	90	ZPHY C48 445	J.H. Kuhn <i>et al.</i>	(MPIM)	REFID=45862
ISGUR	89	PR D39 1357	N. Isgur, C. Morningstar, C. Reader	(TNTO)	REFID=40730
BOWLER	88	PL B209 99	M.G. Bowler	(OXF)	REFID=40578
BAND	87	PL B198 297	H.R. Band <i>et al.</i>	(MAC Collab.)	REFID=40263
TORNQVIST	87	ZPHY C36 695	N.A. Tornqvist	(HELS)	REFID=40030
ALBRECHT	86B	ZPHY C33 7	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=20884
RUCKSTUHL	86	PRL 56 2132	W. Ruckstuhl <i>et al.</i>	(DELCO Collab.)	REFID=10349
SCHMIDKE	86	PRL 57 527	W.B. Schmidke <i>et al.</i>	(Mark II Collab.)	REFID=10350
BELLINI	85	SJNP 41 781	D. Bellini <i>et al.</i>		REFID=47490
Translated from YAF 41 1223.					
ZIELINSKI	84C	PRL 52 1195	M. Zielinski <i>et al.</i>	(ROCH, MINN, FNAL)	REFID=20882
LONGACRE	82	PR D26 82	R.S. Longacre	(BNL)	REFID=20878
DANKOWY...	81	PRL 46 580	J.A. Dankowich <i>et al.</i>	(TNTO, BNL, CARL+)	REFID=20572
DAUM	81B	NP B182 269	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)	REFID=20872
DAUM	80	PL 89B 281	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+) JP	REFID=20868
GAVILLET	77	PL 69B 119	P. Gavillet <i>et al.</i>	(AMST, CERN, NIJM+) JP	REFID=20852
BOWLER	75	NP B97 227	M.G. Bowler <i>et al.</i>	(OXFTP, DARE)	REFID=20571

f₂(1270)

$I^G(J^{PC}) = 0^+(2^{++})$

f₂(1270) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1275.1 ± 1.2 OUR AVERAGE				Error includes scale factor of 1.1.	
1262 + 1 - 2	± 8	ABLIKIM	06V	BES2 $e^+ e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$	
1275 ± 15		ABLIKIM	05	BES2 $J/\psi \rightarrow \phi\pi^+\pi^-$	
1283 ± 5		ALDE	98	GAM4 $100\pi^- p \rightarrow \pi^0\pi^0 n$	
1278 ± 5		¹ BERTIN	97C	OBLX $0.0\bar{p}p \rightarrow \pi^+\pi^-\pi^0$	
1272 ± 8	200k	PROKOSHKIN	94	GAM2 $38\pi^- p \rightarrow \pi^0\pi^0 n$	
1269.7 ± 5.2	5730	AUGUSTIN	89	DM2 $e^+ e^- \rightarrow 5\pi$	
1283 ± 8	400	² ALDE	87	GAM4 $100\pi^- p \rightarrow 4\pi^0 n$	
1274 ± 5		² AUGUSTIN	87	DM2 $J/\psi \rightarrow \gamma\pi^+\pi^-$	
1283 ± 6		³ LONGACRE	86	MPS $22\pi^- p \rightarrow n2K_S^0$	
1276 ± 7		COURAU	84	DLCO $e^+ e^- \rightarrow e^+ e^-\pi^+\pi^-$	
1273.3 ± 2.3		⁴ CHABAUD	83	ASPK $17\pi^- p$ polarized	
1280 ± 4		⁵ CASON	82	STRC $8\pi^+ p \rightarrow \Delta^{++}\pi^0\pi^0$	
1281 ± 7	11600	GIDAL	81	MRK2 J/ψ decay	
1282 ± 5		⁶ CORDEN	79	OMEG $12-15\pi^- p \rightarrow n2\pi$	
1269 ± 4	10k	APEL	75	NICE $40\pi^- p \rightarrow n2\pi^0$	
1272 ± 4	4600	ENGLER	74	DBC $6\pi^+ n \rightarrow \pi^+\pi^- p$	
1277 ± 4	5300	FLATTE	71	HBC $7.0\pi^+ p$	
1273 ± 8		² STUNTEBECK	70	HBC $8\pi^- p, 5.4\pi^+ d$	
1265 ± 8		BOESEBECK	68	HBC $8\pi^+ p$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1270 ± 8		⁷ ANISOVICH	09	RVUE $0.0\bar{p}p, \pi N$	
1277 ± 6	870	⁸ SCHEGELSKY	06A	RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$	
1251 ± 10		TIKHOMIROV	03	SPEC $40.0\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	
1260 ± 10		⁹ ALDE	97	GAM2 $450\bar{p}p \rightarrow pp\pi^0\pi^0$	
1278 ± 6		⁹ GRYGOREV	96	SPEC $40\pi^- N \rightarrow K_S^0 K_S^0 X$	
1262 ± 11		AGUILAR-...	91	EHS $400\bar{p}p$	
1275 ± 10		AKER	91	CBAR $0.0\bar{p}p \rightarrow 3\pi^0$	
1220 ± 10		BREAKSTONE	90	SFM $p\bar{p} \rightarrow pp\pi^+\pi^-$	
1288 ± 12		ABACHI	86B	HRS $e^+ e^- \rightarrow \pi^+\pi^- X$	
1284 ± 30	3k	BINON	83	GAM2 $38\pi^- p \rightarrow n2\eta$	
1280 ± 20	3k	APEL	82	CNTR $25\pi^- p \rightarrow n2\pi^0$	
1284 ± 10	16000	DEUTSCH...	76	HBC $16\pi^+ p$	
1258 ± 10	600	TAKAHASHI	72	HBC $8\pi^- p \rightarrow n2\pi$	
1275 ± 13		ARMENISE	70	HBC $9\pi^+ n \rightarrow p\pi^+\pi^-$	OCCUR=2
1261 ± 5	1960	² ARMENISE	68	DBC $5.1\pi^+ n \rightarrow p\pi^+ MM^-$	OCCUR=2
1270 ± 10	360	² ARMENISE	68	DBC $5.1\pi^+ n \rightarrow p\pi^0 MM$	OCCUR=2
1268 ± 6		¹⁰ JOHNSON	68	HBC $3.7-4.2\pi^- p$	

NODE=M005

NODE=M005M

NODE=M005M

- 1 T-matrix pole.
 2 Mass errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.
 3 From a partial-wave analysis of data using a K-matrix formalism with 5 poles.
 4 From an energy-independent partial-wave analysis.
 5 From an amplitude analysis of the reaction $\pi^+ \pi^- \rightarrow 2\pi^0$.
 6 From an amplitude analysis of $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$ scattering data.
 7 4-poles, 5-channel K matrix fit.
 8 From analysis of L3 data at 91 and 183–209 GeV.
 9 Systematic uncertainties not estimated.
 10 JOHNSON 68 includes BONDAR 63, LEE 64, DERADO 65, EISNER 67.

$f_2(1270)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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185.1 \pm 2.9 OUR FIT Error includes scale factor of 1.5.

184.2 \pm 4.0 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.

175 \pm 6 190 \pm 20 171 \pm 10 204 \pm 20 192 \pm 5 180 \pm 24 169 \pm 9 150 \pm 30 186 \pm 9 179.2 \pm 6.9 160 \pm 11 196 \pm 10 152 \pm 9 186 \pm 27 216 \pm 13 190 \pm 10 192 \pm 16 183 \pm 15 196 \pm 30 216 \pm 20 128 \pm 27 176 \pm 21	\pm 10 ABLIKIM ALDE BERTIN PROKOSHKIN AGUILAR-... AUGUSTIN ALDE LONGACRE CHABAUD DENNEY APEL CASON GIDAL CORDEN APEL ENGLER FLATTE STUNTEBECK ARMENISE BOESEBECK JOHNSON	06v 05 98 97c 94 91 89 87 86 83 83 82 82 81 79 75 74 71 70 68 68 68 11600 3k 10k 4600 5300 1960 1960 12,17	BES2 BES2 GAM4 OBLX GAM2 EHS DM2 GAM4 MPS ASPK LASS CNTR STRC MRK2 OMEG NICE DBC HBC HBC HBC HBC HBC HBC RVUE RVUE SPEC GAM2 SPEC CBAR GAM2 CIBS HBC HBC HBC HBC	$e^+ e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$ $J/\psi \rightarrow \phi \pi^+ \pi^-$ $\pi^- p \rightarrow \pi^0 \pi^0 n$ $0.0 \bar{p} p \rightarrow \pi^+ \pi^- \pi^0$ $\pi^- p \rightarrow \pi^0 \pi^0 n$ $400 pp$ $e^+ e^- \rightarrow 5\pi$ $\pi^- p \rightarrow 4\pi^0 n$ $22 \pi^- p \rightarrow n 2K_S^0$ $17 \pi^- p$ polarized $10 \pi^+ N$ $25 \pi^- p \rightarrow n 2\pi^0$ $8 \pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$ J/ψ decay $12-15 \pi^- p \rightarrow n 2\pi$ $40 \pi^- p \rightarrow n 2\pi^0$ $6 \pi^+ n \rightarrow \pi^+ \pi^- p$ $7 \pi^+ p \rightarrow \Delta^{++} f_2$ $8 \pi^- p, 5.4 \pi^+ d$ $5.1 \pi^+ n \rightarrow p \pi^+ MM^-$ $8 \pi^+ p$ $3.7-4.2 \pi^- p$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

194 \pm 36 195 \pm 15 121 \pm 26 187 \pm 20 184 \pm 10 200 \pm 10 240 \pm 40 187 \pm 30 225 \pm 38 166 \pm 28 173 \pm 53	18 ANISOVICH 19 SCHEGELSKY TIKHOMIROV 20 ALDE 20 GRYGOREV AKER BINON 12 ANTIPOV DEUTSCH... 12 TAKAHASHI 12 ARMENISE	09 06A 03 97 96 91 83 77 76 72 70	RVUE RVUE SPEC GAM2 SPEC CBAR GAM2 CIBS HBC HBC HBC	$0.0 \bar{p} p, \pi N$ $\gamma \gamma \rightarrow K_S^0 K_S^0$ $40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 \times$ $450 pp \rightarrow pp \pi^0 \pi^0$ $40 \pi^- N \rightarrow K_S^0 K_S^0 \times$ $0.0 \bar{p} p \rightarrow 3\pi^0$ $38 \pi^- p \rightarrow n 2\eta$ $25 \pi^- p \rightarrow p 3\pi$ $16 \pi^+ p$ $8 \pi^- p \rightarrow n 2\pi$ $9 \pi^+ n \rightarrow p \pi^+ \pi^-$
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- 11 T-matrix pole.
 12 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
 13 From a partial-wave analysis of data using a K-matrix formalism with 5 poles.
 14 From an energy-independent partial-wave analysis.
 15 From an amplitude analysis of the reaction $\pi^+ \pi^- \rightarrow 2\pi^0$.
 16 From an amplitude analysis of $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$ scattering data.
 17 JOHNSON 68 includes BONDAR 63, LEE 64, DERADO 65, EISNER 67.
 18 4-poles, 5-channel K matrix fit.
 19 From analysis of L3 data at 91 and 183–209 GeV.
 20 Systematic uncertainties not estimated.

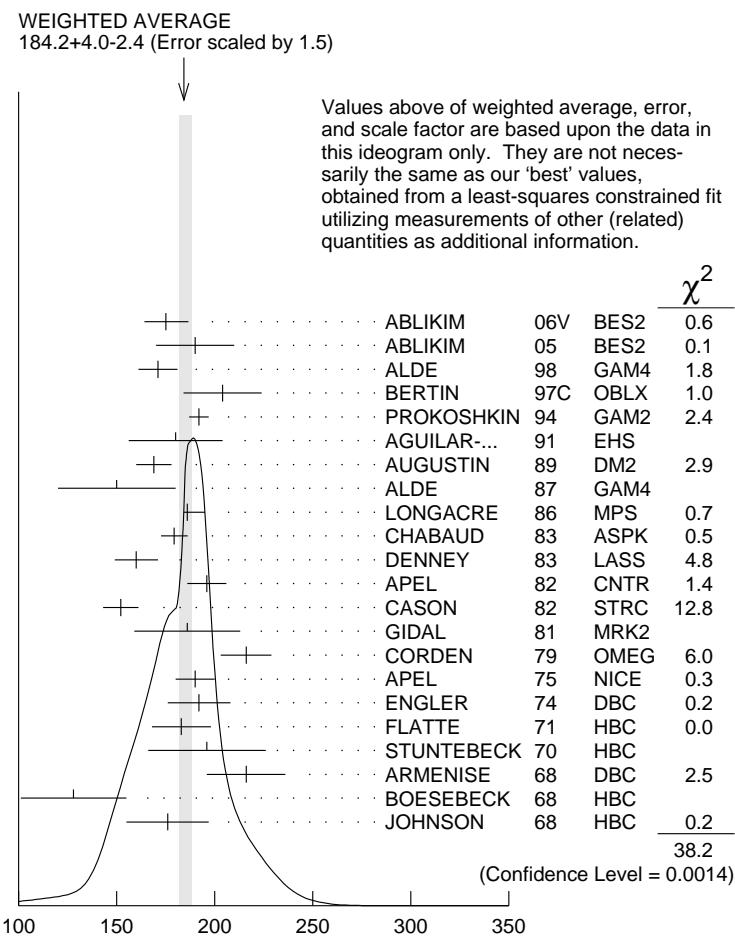
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$f_2(1270)$ width (MeV)

$f_2(1270)$ DECAY MODES

NODE=M005215; NODE=M005

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
$\Gamma_1 \pi\pi$	(84.8 $^{+2.4}_{-1.2}$) %	S=1.2	DESIG=1
$\Gamma_2 \pi^+\pi^-2\pi^0$	(7.1 $^{+1.4}_{-2.7}$) %	S=1.3	DESIG=3
$\Gamma_3 K\bar{K}$	(4.6 ± 0.4) %	S=2.8	DESIG=4
$\Gamma_4 2\pi^+2\pi^-$	(2.8 ± 0.4) %	S=1.2	DESIG=2
$\Gamma_5 \eta\eta$	(4.0 ± 0.8) $\times 10^{-3}$	S=2.1	DESIG=7
$\Gamma_6 4\pi^0$	(3.0 ± 1.0) $\times 10^{-3}$		DESIG=9
$\Gamma_7 \gamma\gamma$	(1.64 ± 0.19) $\times 10^{-5}$	S=1.9	DESIG=8
$\Gamma_8 \eta\pi\pi$	< 8 $\times 10^{-3}$	CL=95%	DESIG=6
$\Gamma_9 K^0 K^- \pi^+ + \text{c.c.}$	< 3.4 $\times 10^{-3}$	CL=95%	DESIG=5
$\Gamma_{10} e^+e^-$	< 6 $\times 10^{-10}$	CL=90%	DESIG=10

CONSTRAINED FIT INFORMATION

An overall fit to the total width, 4 partial widths, a combination of partial widths obtained from integrated cross sections, and 6 branching ratios uses 44 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 81.8$ for 37 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	-91						
x_3	11	-39					
x_4	10	-37	1				
x_5	1	-6	0	0			
x_6	0	-7	0	0	0		
x_7	8	-5	-6	1	0	0	
Γ	-78	71	-11	-8	-1	0	-11
	x_1	x_2	x_3	x_4	x_5	x_6	x_7

Mode	Rate (MeV)	Scale factor
$\Gamma_1 \pi\pi$	156.9	+4.0 -1.2
$\Gamma_2 \pi^+ \pi^- 2\pi^0$	13.2	+2.8 -5.0
$\Gamma_3 K\bar{K}$	8.5	± 0.8
$\Gamma_4 2\pi^+ 2\pi^-$	5.2	± 0.7
$\Gamma_5 \eta\eta$	0.74	± 0.14
$\Gamma_6 4\pi^0$	0.55	± 0.18
$\Gamma_7 \gamma\gamma$	0.00303 ± 0.00035	1.9

$f_2(1270)$ PARTIAL WIDTHS

$\Gamma(\pi\pi)$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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$156.9^{+4.0}_{-1.2}$ OUR FIT

$157.0^{+6.0}_{-1.0}$ 21 LONGACRE 86 MPS $22 \pi^- p \rightarrow n2K_S^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

152 ± 8 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

Γ_1

DESIG=1

NODE=M005220

DESIG=3

DESIG=4

DESIG=2

DESIG=7

DESIG=9

DESIG=8

NODE=M005W1

NODE=M005W1

$\Gamma(K\bar{K})$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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8.5 ± 0.8 OUR FIT Error includes scale factor of 2.9.

$9.0^{+0.7}_{-0.3}$ 21 LONGACRE 86 MPS $22 \pi^- p \rightarrow n2K_S^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

7.5 ± 2.0 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

Γ_3

NODE=M005W4

NODE=M005W4

$\Gamma(\eta\eta)$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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0.74 ± 0.14 OUR FIT Error includes scale factor of 2.1.

1.0 ± 0.1 21 LONGACRE 86 MPS $22 \pi^- p \rightarrow n2K_S^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.8 ± 0.4 870 22 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

Γ_5

NODE=M005W7

NODE=M005W7

$\Gamma(\gamma\gamma)$

Γ_7

NODE=M005W8

NODE=M005W8

The value of this width depends on the theoretical model used. Unitary approaches with scalars typically (with exception of PENNINGTON 08) give values clustering around 2.6 keV; without an S-wave contribution, values are systematically higher (typically around 3 keV).

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
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3.03 ± 0.35 OUR FIT Error includes scale factor of 1.9.

3.14 ± 0.20 23,24 PENNINGTON 08 RVUE Compilation

NODE=M005W8

OCCUR=2

• • • We do not use the following data for averages, fits, limits, etc. • • •

3.82±0.30	24,25	PENNINGTON 08	RVUE	Compilation	OCCUR=3
2.55±0.15	870	22 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$	
2.84±0.35		BOGLIONE 99	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	
2.93±0.23±0.32		26 YABUKI 95	VNS		
2.58±0.13 ^{+0.36} _{-0.27}		27 BEHREND 92	CELL	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
3.10±0.35±0.35		28 BLINOV 92	MD1	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
2.27±0.47±0.11		ADACHI 90D	TOPZ	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
3.15±0.04±0.39		BOYER 90	MRK2	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
3.19±0.16 ^{+0.29} _{-0.28}		MARSISKE 90	CBAL	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	
2.35±0.65		29 MORGAN 90	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^-, \pi^0 \pi^0$	
3.19±0.09 ^{+0.22} _{-0.38}	2177	OEST 90	JADE	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	
3.2 ±0.1 ±0.4		30 AIHARA 86B	TPC	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
2.5 ±0.1 ±0.5		BEHREND 84B	CELL	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
2.85±0.25±0.5		31 BERGER 84	PLUT	$e^+ e^- \rightarrow e^+ e^- 2\pi$	
2.70±0.05±0.20		COURAU 84	DLCO	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
2.52±0.13±0.38		32 SMITH 84C	MRK2	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
2.7 ±0.2 ±0.6		EDWARDS 82F	CBAL	$e^+ e^- \rightarrow e^+ e^- 2\pi^0$	
2.9 ^{+0.6} _{-0.4} ±0.6		33 EDWARDS 82F	CBAL	$e^+ e^- \rightarrow e^+ e^- 2\pi^0$	OCCUR=2
3.2 ±0.2 ±0.6		BRANDELIK 81B	TASS	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
3.6 ±0.3 ±0.5		ROUSSARIE 81	MRK2	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$	
2.3 ±0.8		34 BERGER 80B	PLUT	$e^+ e^-$	

$\Gamma(e^+ e^-)$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{10}
<0.11	90	ACHASOV 00K	SND	$e^+ e^- \rightarrow \pi^0 \pi^0$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.7	90	VOROBYEV 88	ND	$e^+ e^- \rightarrow \pi^0 \pi^0$
------	----	-------------	----	-----------------------------------

21 From a partial-wave analysis of data using a K-matrix formalism with 5 poles.

22 From analysis of L3 data at 91 and 183–209 GeV and using SU(3) relations.

23 Solution A (preferred solution based on χ^2 -analysis).

24 Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.

25 Solution B (worse than solution A; still acceptable when systematic uncertainties are included).

26 With a narrow scalar state around 1220 MeV.

27 Using a unitarized model with a 300 - 500 keV wide scalar at 1100 MeV.

28 Using the unitarized model of LYTH 85.

29 Error includes spread of different solutions. Data of MARK2 and CRYSTAL BALL used in the analysis. Authors report strong correlations with $\gamma\gamma$ width of $f_0(1370)$: $\Gamma(f_2) + 1/4 \Gamma(f^0) = 3.6 \pm 0.3$ KeV.

30 Radiative corrections modify the partial widths; for instance the COURAU 84 value becomes 2.66 ± 0.21 in the calculation of LANDRO 86.

31 Using the MENNESSIER 83 model.

32 Superseded by BOYER 90.

33 If helicity = 2 assumption is not made.

34 Using mass, width and $B(f_2(1270) \rightarrow 2\pi)$ from PDG 78.

NODE=M005W9
NODE=M005W9

NODE=M005PW;LINKAGE=L
NODE=M005W1;LINKAGE=SC
NODE=M005W8;LINKAGE=P1
NODE=M005W8;LINKAGE=P3

NODE=M005W8;LINKAGE=P2

NODE=M005W8;LINKAGE=YA
NODE=M005W;LINKAGE=B
NODE=M005W;LINKAGE=A
NODE=M005PW;LINKAGE=C

NODE=M005PW;LINKAGE=B

NODE=M005PW;LINKAGE=X
NODE=M005PW;LINKAGE=V
NODE=M005PW;LINKAGE=H
NODE=M005PW;LINKAGE=A

NODE=M005223

NODE=M005G1
NODE=M005G1

OCCUR=2

NODE=M005G1;LINKAGE=A
NODE=M005G1;LINKAGE=K

NODE=M005G02
NODE=M005G02

NODE=M005G02;LINKAGE=UE

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT	$\Gamma_3\Gamma_7/\Gamma$
0.139 ^{±0.019} OUR FIT			Error includes scale factor of 1.9.	

0.091^{±0.007±0.027} Error includes scale factor of 1.9.

35 ALBRECHT 90G ARG $e^+ e^- \rightarrow e^+ e^- K^+ K^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.104±0.007±0.072 36 ALBRECHT 90G ARG $e^+ e^- \rightarrow e^+ e^- K^+ K^-$

35 Using an incoherent background.

36 Using a coherent background.

NODE=M005G1;LINKAGE=A
NODE=M005G1;LINKAGE=K

NODE=M005G02
NODE=M005G02

NODE=M005G02;LINKAGE=UE

Helicity-0/Helicity-2 RATIO IN $\gamma\gamma \rightarrow f_2(1270) \rightarrow \pi\pi$

<u>VALUE</u> (units 10^{-2})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$3.7 \pm 0.3^{+15.9}_{-2.9}$	UEHARA	08A	BELL $10.6 \pi^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
13	38,39	PENNINGTON 08	RVUE Compilation
26	39,40	PENNINGTON 08	RVUE Compilation
38 Solution A (preferred solution based on χ^2 -analysis).			
39 Dispersion theory based amplitude analysis of BOYER 90, MARSISKE 90, BEHREND 92, and MORI 07.			
40 Solution B (worse than solution A; still acceptable when systematic uncertainties are included).			

NODE=M005HR0
NODE=M005HR0 **$f_2(1270)$ BRANCHING RATIOS**

<u>$\Gamma(\pi\pi)/\Gamma_{\text{total}}$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_1/Γ</u>
$0.848^{+0.024}_{-0.012}$ OUR FIT				Error includes scale factor of 1.2.	

NODE=M005225

<u>$\Gamma(\pi^+ \pi^- 2\pi^0)/\Gamma(\pi\pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_1/Γ</u>
0.849 ± 0.025		CHABAUD	83	ASPK $17 \pi^- p$ polarized	
0.85 ± 0.05	250	BEAUPRE	71	HBC $8 \pi^+ p \rightarrow \Delta^{++} f_2$	
0.8 ± 0.04	600	OH	70	HBC $1.26 \pi^- p \rightarrow \pi^+ \pi^- n$	

NODE=M005R10
NODE=M005R10

<u>$\Gamma(\pi^+ \pi^- 2\pi^0)/\Gamma(\pi\pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_2/Γ_1</u>
0.84 ± 0.018 OUR FIT				Should be twice $\Gamma(2\pi^+ 2\pi^-)/\Gamma(\pi\pi)$ if decay is $\rho\rho$. (See ASCOLI 68D.)	
0.15 ± 0.06	600	EISENBERG	74	HBC $4.9 \pi^+ p \rightarrow \Delta^{++} f_2$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.07		EMMS	75D	DBC $4 \pi^+ n \rightarrow p f_2$	

NODE=M005R2
NODE=M005R2
NODE=M005R2

<u>$\Gamma(K\bar{K})/\Gamma(\pi\pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_3/Γ_1</u>
We average only experiments which either take into account $f_2(1270)$ - $a_2(1320)$ interference explicitly or demonstrate that $a_2(1320)$ production is negligible.					

NODE=M005R3
NODE=M005R3
NODE=M005R3

<u>$\Gamma(K\bar{K})/\Gamma(\pi\pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_3/Γ_1</u>
0.054 ± 0.005 OUR FIT				Error includes scale factor of 2.8.	
0.041 ± 0.004 OUR AVERAGE					
0.045 ± 0.01	41	BARGIOTTI	03	OBLX $\bar{p}p$	
0.037 ± 0.008		ETKIN	82B	MPS $23 \pi^- p \rightarrow n 2K_S^0$	
0.045 ± 0.009		CHABAUD	81	ASPK $17 \pi^- p$ polarized	
0.039 ± 0.008		LOVERRE	80	HBC $4 \pi^- p \rightarrow K\bar{K}N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.052 ± 0.025		ABLIKIM	04E	BES2 $J/\psi \rightarrow \omega K^+ K^-$	
0.036 ± 0.005	42	COSTA...	80	OMEG $1-2.2 \pi^- p \rightarrow K^+ K^- n$	
0.030 ± 0.005		43 MARTIN	79	RVUE	
0.027 ± 0.009		44 POLYCHRO...	79	STRC $7 \pi^- p \rightarrow n 2K_S^0$	
0.025 ± 0.015		EMMS	75D	DBC $4 \pi^+ n \rightarrow p f_2$	
0.031 ± 0.012	20	ADERHOLZ	69	HBC $8 \pi^+ p \rightarrow K^+ K^- \pi^+ p$	

<u>$\Gamma(2\pi^+ 2\pi^-)/\Gamma(\pi\pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u>Γ_4/Γ_1</u>
0.033 ± 0.005 OUR FIT				Error includes scale factor of 1.2.	
0.033 ± 0.004 OUR AVERAGE				Error includes scale factor of 1.1.	
0.024 ± 0.006	160	EMMS	75D	DBC $4 \pi^+ n \rightarrow p f_2$	
0.051 ± 0.025	70	EISENBERG	74	HBC $4.9 \pi^+ p \rightarrow \Delta^{++} f_2$	
0.043 ± 0.007	285	LOUIE	74	HBC $3.9 \pi^- p \rightarrow n f_2$	
0.037 ± 0.007	154	ANDERSON	73	DBC $6 \pi^+ n \rightarrow p f_2$	
0.047 ± 0.013		OH	70	HBC $1.26 \pi^- p \rightarrow \pi^+ \pi^- n$	

NODE=M005R1
NODE=M005R1

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$					Γ_5/Γ	NODE=M005R7 NODE=M005R7
VALUE (units 10^{-3})		DOCUMENT ID	TECN	COMMENT		
4.0±0.8 OUR FIT Error includes scale factor of 2.1.						
2.9±0.5 OUR AVERAGE						
2.7±0.7	BINON	05	GAMS	33 $\pi^- p \rightarrow \eta\eta n$		
2.8±0.7	ALDE	86D	GAM4	100 $\pi^- p \rightarrow 2\eta n$		
5.2±1.7	BINON	83	GAM2	38 $\pi^- p \rightarrow 2\eta n$		
$\Gamma(\eta\eta)/\Gamma(\pi\pi)$					Γ_5/Γ_1	NODE=M005R6 NODE=M005R6
VALUE	CL%	DOCUMENT ID	TECN	COMMENT		
0.003±0.001		BARBERIS	00E	450 $p p \rightarrow p_f \eta\eta p_s$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.05	95	EDWARDS	82F	CBAL $e^+ e^- \rightarrow e^+ e^- 2\eta$		
<0.016	95	EMMS	75D	DBC $4 \pi^+ n \rightarrow p f_2$		
<0.09	95	EISENBERG	74	HBC $4.9 \pi^+ p \rightarrow \Delta^{++} f_2$		
$\Gamma(4\pi^0)/\Gamma_{\text{total}}$					Γ_6/Γ	NODE=M005R11 NODE=M005R11
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT		
0.0030±0.0010 OUR FIT						
0.003 ± 0.001	400 ± 50	ALDE	87	GAM4 $100 \pi^- p \rightarrow 4\pi^0 n$		
$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					Γ_7/Γ	NODE=M005R13 NODE=M005R13
VALUE (units 10^{-5})		DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$1.57 \pm 0.01^{+1.39}_{-0.14}$	UEHARA	08A	BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$		
$\Gamma(\eta\pi\pi)/\Gamma(\pi\pi)$					Γ_8/Γ_1	NODE=M005R5 NODE=M005R5
VALUE	CL%	DOCUMENT ID	TECN	COMMENT		
<0.010	95	EMMS	75D	DBC $4 \pi^+ n \rightarrow p f_2$		
$\Gamma(K^0 K^- \pi^+ + \text{c.c.})/\Gamma(\pi\pi)$					Γ_9/Γ_1	NODE=M005R4 NODE=M005R4
VALUE	CL%	DOCUMENT ID	TECN	COMMENT		
<0.004	95	EMMS	75D	DBC $4 \pi^+ n \rightarrow p f_2$		
$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$					Γ_{10}/Γ	NODE=M005R12 NODE=M005R12
VALUE (units 10^{-10})	CL%	DOCUMENT ID	TECN	COMMENT		
<6	90	ACHASOV	00K	SND $e^+ e^- \rightarrow \pi^0 \pi^0$		
41 Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^\mp \pi^\mp$.						
42 Re-evaluated by CHABAUD 83.						
43 Includes PAWICKI 77 data.						
44 Takes into account the $f_2(1270)-f'_2(1525)$ interference.						
$f_2(1270)$ REFERENCES						
UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)		NODE=M005
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev		REFID=53641	
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)	REFID=52719	
PENNINGTON	08	EPJ C56 1	M.R. Pennington <i>et al.</i>		REFID=52166	
UEHARA	08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=52303	
MORI	07	PR D75 051101	T. Mori <i>et al.</i>	(BELL Collab.)	REFID=52309	
ABLIKIM	06V	PL B642 441	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51652	
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>		REFID=51507	
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51185	
BINON	05	PAN 68 960	F. Binon <i>et al.</i>		REFID=50450	
		Translated from YAF 68 998.			REFID=50780	
ABLIKIM	04E	PL B603 138	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50174	
BARGIOTTI	03	EPJ C26 371	M. Bargiotti <i>et al.</i>	(OBELIX Collab.)	REFID=49217	
TIKHOLOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>		REFID=49423	
		Translated from YAF 66 860.				
ACHASOV	00K	PL B492 8	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	REFID=47933	
BARBERIS	00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=47961	
BOGLIONE	99	EPJ C9 11	M. Boglione, M.R. Pennington		REFID=46931	
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)	REFID=46605	
Also		PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)	REFID=46914	
		Translated from YAF 62 446.				
ALDE	97	PL B397 350	D.M. Alde <i>et al.</i>	(GAMS Collab.)	REFID=45392	
BERTIN	97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45701	
GRYGOREV	96	PAN 59 2105	V.K. Grigoriev, O.N. Baloshin, B.P. Barkov	(ITEP)	REFID=45566	
		Translated from YAF 59 2187.				
YABUKI	95	JPSJ 64 435	F. Yabuki <i>et al.</i>	(VENUS Collab.)	REFID=46384	
PROKOSHKIN	94	SPD 39 420	Y.D. Prokoshkin, A.A. Kondashov	(SERP)	REFID=44094	
		Translated from DANS 336 613.				

BEHREND	92	ZPHY C56 381	H.J. Behrend	(CELLO Collab.)	REFID=43172
BLINOV	92	ZPHY C53 33	A.E. Blinov <i>et al.</i>	(NOVO)	REFID=41858
AGUILAR-...	91	ZPHY C50 405	M. Aguilar-Benitez <i>et al.</i>	(LEBC-EHS Collab.)	REFID=41637
AKER	91	PL B260 249	E. Aker <i>et al.</i>	(Crystal Barrel Collab.)	REFID=41587
ADACHI	90D	PL B234 185	I. Adachi <i>et al.</i>	(TOPAZ Collab.)	REFID=41345
ALBRECHT	90G	ZPHY C48 183	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=41374
BOYER	90	PR D42 1350	J. Boyer <i>et al.</i>	(Mark II Collab.)	REFID=41362
BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone <i>et al.</i>	(ISU, BGNA, CERN+)	REFID=41376
MARSISKE	90	PR D41 3324	H. Marsiske <i>et al.</i>	(Crystal Ball Collab.)	REFID=41351
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)	REFID=41583
OEST	90	ZPHY C47 343	T. Oest <i>et al.</i>	(JADE Collab.)	REFID=41358
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41004
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)	REFID=41023
Translated from YAF 48 436.					
ALDE	87	PL B198 286	D.M. Alde <i>et al.</i>	(LANL, BRUX, SERP, LAPP)	REFID=40221
AUGUSTIN	87	ZPHY C36 369	J.E. Augustin <i>et al.</i>	(LAJO, CLER, FRAS+)	REFID=40268
ABACHI	86B	PRL 57 1990	S. Abachi <i>et al.</i>	(PURD, ANL, IND, MICH+)	REFID=20394
AIHARA	86B	PRL 57 404	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)	REFID=20764
ALDE	86D	NP B269 485	D.M. Alde <i>et al.</i>	(BELG, LAPP, SERP, CERN+)	REFID=20765
LANDRO	86	PL B172 445	M. Landro, K.J. Mork, H.A. Olsen	(UTRO)	REFID=20767
LONGACRE	86	PL B177 223	R.S. Longacre <i>et al.</i>	(BNL, BRAN, CUNY+)	REFID=20768
LYTH	85	JPG 11 459	D.H. Lyth		REFID=42169
BEHREND	84B	ZPHY C23 223	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=20757
BERGER	84	ZPHY C26 199	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=20760
COURAU	84	PL 147B 227	A. Courau <i>et al.</i>	(CIT, SLAC)	REFID=20758
SMITH	84C	PR D30 851	J.R. Smith <i>et al.</i>	(SLAC, LBL, HARV)	REFID=20759
BINON	83	NC 78A 313	F.G. Binon <i>et al.</i>	(BELG, LAPP, SERP+)	REFID=20750
Also		SJNP 38 561	F.G. Binon <i>et al.</i>	(BELG, LAPP, SERP+)	REFID=20751
Translated from YAF 38 934.					
CHABAUD	83	NP B223 1	V. Chabaud <i>et al.</i>	(CERN, CRAC, MPIM)	REFID=20131
DENNEY	83	PR D28 2726	D.L. Denney <i>et al.</i>	(IOWA, MICH)	REFID=20754
MENNESSIER	83	ZPHY C16 241	G. Mennessier	(MONP)	REFID=20393
APEL	82	NP B201 197	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA, SERP+)	REFID=20745
CASON	82	PRL 48 1316	N.M. Cason <i>et al.</i>	(NDAM, ANL)	REFID=20746
EDWARDS	82F	PL 110B 82	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=20747
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)	REFID=20390
BRANDELIK	81B	ZPHY C10 117	R. Brandelik <i>et al.</i>	(TASSO Collab.)	REFID=20741
CHABAUD	81	APP B12 575	V. Chabaud <i>et al.</i>	(CERN, CRAC, MPIM)	REFID=20742
GIDAL	81	PL 107B 153	G. Gidal <i>et al.</i>	(SLAC, LBL)	REFID=20386
ROUSSARIE	81	PL 105B 304	A. Roussarie <i>et al.</i>	(SLAC, LBL)	REFID=20388
BERGER	80B	PL 94B 254	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=20736
COSTA...	80	NP B175 402	G. Costa de Beauregard <i>et al.</i>	(BARI, BONN+)	REFID=20737
LOVERRE	80	ZPHY C6 187	P.F. Loverre <i>et al.</i>	(CERN, CDEF, MADR+)	REFID=20382
CORDEN	79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+)	REFID=20374
MARTIN	79	NP B158 520	A.D. Martin, E.N. Ozmutlu	(DURH)	REFID=20377
POLYCHRO...	79	PR D19 1317	V.A. Polychronakos <i>et al.</i>	(NDAM, ANL)	REFID=20378
PDG	78	PL 75B 1	C. Bricman <i>et al.</i>		REFID=40124
ANTIPOV	77	NP B119 45	Y.M. Antipov <i>et al.</i>	(SERP, GEVA)	REFID=20728
PAWLICKI	77	PR D15 3196	A.J. Pawlicki <i>et al.</i>	(ANL)	REFID=20367
DEUTSCH...	76	NP B103 426	M. Deutschmann <i>et al.</i>	(AACH3, BERL, BONN+)	REFID=20119
APEL	75	PL 57B 398	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA, SERP+)	REFID=20720
EMMS	75D	NP B96 155	M.J. Emms <i>et al.</i>	(BIRM, DURH, RHEL)	REFID=20721
EISENBERG	74	PL 52B 239	Y. Eisenberg <i>et al.</i>	(REHO)	REFID=20715
ENGLER	74	PR D10 2070	A. Engler <i>et al.</i>	(CMU, CASE)	REFID=20110
LOUIE	74	PL 48B 385	J. Louie <i>et al.</i>	(SACL, CERN)	REFID=20719
ANDERSON	73	PRL 31 562	J.C. Anderson <i>et al.</i>	(CMU, CASE)	REFID=20710
TAKAHASHI	72	PL D6 1266	K. Takahashi <i>et al.</i>	(TOHOK, PENN, NDAM+)	REFID=20103
BEAUPRE	71	NP B28 77	J.V. Beaupre <i>et al.</i>	(AACH, BERL, CERN)	REFID=20698
FLATTE	71	PL 34B 551	S.M. Flatte <i>et al.</i>	(LBL)	REFID=20700
ARMENISE	70	LNC 4 199	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ)	REFID=20693
OH	70	PR D1 2494	B.Y. Oh <i>et al.</i>	(WISC, TNTO) JP	REFID=20335
STUNTEBECK	70	PL 32B 391	P.H. Stuntebeck <i>et al.</i>	(NDAM)	REFID=20696
ADERHOLZ	69	NP B11 259	M. Aderholz <i>et al.</i>	(AACH3, BERL, CERN+)	REFID=20687
ARMENISE	68	NC 54A 999	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ+)	REFID=20054
ASCOLI	68D	PRL 21 1712	G. Ascoli <i>et al.</i>	(ILL)	REFID=20681
BOESEBECK	68	NP B4 501	K. Boesebeck <i>et al.</i>	(AACH, BERL, CERN)	REFID=20585
JOHNSON	68	PR 176 1651	P.B. Johnson <i>et al.</i>	(NDAM, PURD, SLAC)	REFID=20065
EISNER	67	PR 164 1699	R.L. Eisner <i>et al.</i>	(PURD)	REFID=20046
DERADO	65	PRL 14 872	I. Derado <i>et al.</i>	(NDAM)	REFID=20668
LEE	64	PRL 12 342	Y.Y. Lee <i>et al.</i>	(MICH)	REFID=20663
BONDAR	63	PL 5 153	L. Bondar <i>et al.</i>	(AACH, BIRM, BONN, DESY+)	REFID=20657

NODE=M008

 $f_1(1285)$ $I^G(J^{PC}) = 0^+(1^{++})$ **$f_1(1285)$ MASS**

NODE=M008M

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1281.9 ± 0.5 OUR AVERAGE				Error includes scale factor of 1.8. See the ideogram below. [1282.1 ± 0.6 MeV OUR 2012 AVERAGE Scale factor = 1.7]
1281.16 ± 0.39 ± 0.45		¹ LEES	12X BABR	$\tau^- \rightarrow \pi^- f_1(1285) \nu_\tau$
1285.1 ± 1.0 ± 1.6		² ABLIKIM	11J BES3	$J/\psi \rightarrow \omega(\eta\pi^+\pi^-)$
1281 ± 2 ± 1		AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow f_1(1285)\pi^+\pi^-\gamma$
1276.1 ± 8.1 ± 8.0	203	BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
1274 ± 6	237	ABDALLAH	03H DLPH	$91.2 e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp + X$
1280 ± 4		ACCIARRI	01G L3	
1288 ± 4 ± 5	20k	ADAMS	01B B852	$18 \text{ GeV } \pi^- p \rightarrow K^+ K^- \pi^0 n$
1284 ± 6	1400	ALDE	97B GAM4	$100 \pi^- p \rightarrow \eta\pi^0\pi^0 n$
1281 ± 1		BARBERIS	97B OMEG	$450 pp \rightarrow pp2(\pi^+\pi^-)$
1281 ± 1		BARBERIS	97C OMEG	$450 pp \rightarrow ppK_S^0 K^\pm \pi^\mp$
1280 ± 2		³ ANTINORI	95 OMEG	$300,450 pp \rightarrow pp2(\pi^+\pi^-)$
1282.2 ± 1.5		LEE	94 MPS2	$18 \pi^- p \rightarrow K^+ \bar{K}^0 2\pi^- p$
1279 ± 5		FUKUI	91C SPEC	$8.95 \pi^- p \rightarrow \eta\pi^+\pi^- n$
1278 ± 2	140	ARMSTRONG	89 OMEG	$300 pp \rightarrow K\bar{K}\pi pp$
1278 ± 2		ARMSTRONG	89G OMEG	$85 \pi^+ p \rightarrow 4\pi\pi p, pp \rightarrow 4\pi pp$
1280.1 ± 2.1	60	RATH	89 MPS	$21.4 \pi^- p \rightarrow K_S^0 K_S^0 \pi^0 n$
1285 ± 1	4750	⁴ BIRMAN	88 MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
1280 ± 1	504	BITYUKOV	88 SPEC	$32.5 \pi^- p \rightarrow K^+ K^- \pi^0 n$
1280 ± 4		ANDO	86 SPEC	$8 \pi^- p \rightarrow \eta\pi^+\pi^- n$
1277 ± 2	420	REEVES	86 SPEC	$6.6 p\bar{p} \rightarrow K\bar{K}\pi X$
1285 ± 2		CHUNG	85 SPEC	$8 \pi^- p \rightarrow N\bar{K}\bar{K}\pi$
1279 ± 2	604	ARMSTRONG	84 OMEG	$85 \pi^+ p \rightarrow K\bar{K}\pi\pi p, pp \rightarrow K\bar{K}\pi pp$
1286 ± 1		CHAUVAT	84 SPEC	ISR 31.5 pp
1278 ± 4		EVANGELIS...	81 OMEG	$12 \pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
1283 ± 3	103	DIONISI	80 HBC	$4 \pi^- p \rightarrow K\bar{K}\pi n$
1282 ± 2	320	NACASCH	78 HBC	$0.7, 0.76 \bar{p}p \rightarrow K\bar{K}3\pi$
1279 ± 5	210	GRASSLER	77 HBC	$16 \pi^\mp p$
1286 ± 3	180	DUBOC	72 HBC	$1.2 \bar{p}p \rightarrow 2K4\pi$
1283 ± 5		DAHL	67 HBC	$1.6-4.2 \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1281.9 ± 0.5		⁵ SOSA	99 SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^+ \pi^-) p_{\text{fast}}$
1282.8 ± 0.6		⁵ SOSA	99 SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^- \pi^+) p_{\text{fast}}$
1270 ± 10		AMELIN	95 VES	$37 \pi^- N \rightarrow \pi^- \pi^+ \pi^- \gamma N$
1280 ± 2		ABATZIS	94 OMEG	$450 pp \rightarrow pp2(\pi^+\pi^-)$
1282 ± 4		ARMSTRONG	93C E760	$\bar{p}p \rightarrow \pi^0 \eta\eta \rightarrow 6\gamma$
1270 ± 6 ± 10		ARMSTRONG	92C OMEG	$300 pp \rightarrow pp\pi^+\pi^-\gamma$
1281 ± 1		ARMSTRONG	89E OMEG	$300 pp \rightarrow pp2(\pi^+\pi^-)$
1279 ± 6 ± 10	16	BECKER	87 MRK3	$e^+e^- \rightarrow \phi K\bar{K}\pi$
1286 ± 9		GIDAL	87 MRK2	$e^+e^- \rightarrow e^+e^- \eta\pi^+\pi^-$
1287 ± 5	353	BITYUKOV	84B SPEC	$32 \pi^- p \rightarrow K^+ K^- \pi^0 n$
~1279		⁶ TORNQVIST	82B RVUE	
1275 ± 6	31	BROMBERG	80 SPEC	$100 \pi^- p \rightarrow K\bar{K}\pi X$
1288 ± 9	200	GURTU	79 HBC	$4.2 K^- p \rightarrow n\eta 2\pi$
~1275.0	46	⁷ STANTON	79 CNTR	$8.5 \pi^- p \rightarrow n2\gamma 2\pi$
1271 ± 10	34	CORDEN	78 OMEG	$12-15 \pi^- p \rightarrow K^+ K^- \pi n$

1295	± 12	85	CORDEN	78	OMEG	12–15	$\pi^- p \rightarrow n\pi$
1292	± 10	150	DEFOIX	72	HBC	0.7	$\bar{p}p \rightarrow 7\pi$
1280	± 3	500	⁸ THUN	72	MMS	13.4	$\pi^- p$
1303	± 8		BARDADIN...	71	HBC	8	$\pi^+ p \rightarrow p6\pi$
1283	± 6		BOESEBECK	71	HBC	16.0	$\pi p \rightarrow p5\pi$
1270	± 10		CAMPBELL	69	DBC	2.7	$\pi^+ d$
1285	± 7		LORSTAD	69	HBC	0.7	$\bar{p}p$, 4,5-body
1290	± 7		D'ANDLAU	68	HBC	1.2	$\bar{p}p$, 5–6 body

1 Using the $2\pi^+ 2\pi^-$ and $\pi^+ \pi^- \eta$ modes of $f_1(1285)$ decay.

2 The selected process is $J/\psi \rightarrow \omega a_0(980)\pi$.

3 Supersedes ABATZIS 94, ARMSTRONG 89E.

4 From partial wave analysis of $K^+ K^0 \pi^-$ system.

5 No systematic error given.

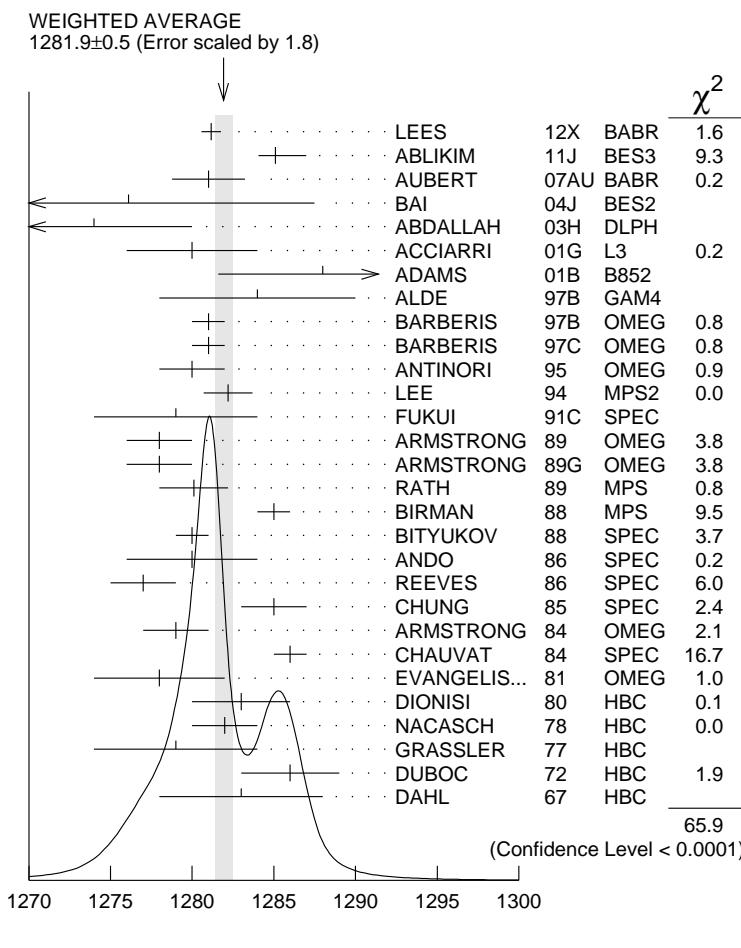
6 From a unitarized quark-model calculation.

7 From phase shift analysis of $\eta \pi^+ \pi^-$ system.

8 Seen in the missing mass spectrum.

OCCUR=2

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NODE=M008M;LINKAGE=BL
NODE=M008M;LINKAGE=B
NODE=M008M;LINKAGE=A
NODE=M008M;LINKAGE=N1
NODE=M008M;LINKAGE=T
NODE=M008M;LINKAGE=P
NODE=M008M;LINKAGE=S



$f_1(1285)$ WIDTH

Only experiments giving width error less than 20 MeV are kept for averaging.

NODE=M008W

NODE=M008W

NODE=M008W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
24.2\pm 1.1 OUR AVERAGE				Error includes scale factor of 1.3. See the ideogram below.
22.0 \pm 3.1 \pm 2.0	9	ABLIKIM	11J BES3	$J/\psi \rightarrow \omega(\eta \pi^+ \pi^-)$
35 \pm 6 \pm 4		AUBERT	07AU BABR	10.6 $e^+ e^- \rightarrow f_1(1285) \pi^+ \pi^- \gamma$
40.0 \pm 8.6 \pm 9.3	203	BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma \pi^+ \pi^-$
29 \pm 12	237	ABDALLAH	03H DLPH	91.2 $e^+ e^- \rightarrow K_S^0 K^\pm \pi^\mp + X$

45 \pm 9 \pm 7	20k	ADAMS	01B	B852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
55 \pm 18	1400	ALDE	97B	GAM4	100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$
24 \pm 3		BARBERIS	97B	OMEG	450 $p p \rightarrow p p 2(\pi^+ \pi^-)$
20 \pm 2		BARBERIS	97C	OMEG	450 $p p \rightarrow p p K_S^0 K^\pm \pi^\mp$
36 \pm 5	10	ANTINORI	95	OMEG	300,450 $p p \rightarrow p p 2(\pi^+ \pi^-)$
29.0 \pm 4.1		LEE	94	MPS2	18 $\pi^- p \rightarrow K^+ \bar{K}^0 2\pi^- p$
25 \pm 4	140	ARMSTRONG	89	OMEG	300 $p p \rightarrow K \bar{K} \pi p p$
22 \pm 2	4750	11 BIRMAN	88	MPS	8 $\pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
25 \pm 4	504	BITYUKOV	88	SPEC	32.5 $\pi^- p \rightarrow K^+ K^- \pi^0 n$
19 \pm 5		ANDO	86	SPEC	8 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$
32 \pm 8	420	REEVES	86	SPEC	6.6 $p \bar{p} \rightarrow K K \pi X$
22 \pm 2		CHUNG	85	SPEC	8 $\pi^- p \rightarrow N K \bar{K} \pi$
32 \pm 3	604	ARMSTRONG	84	OMEG	85 $\pi^+ p \rightarrow K \bar{K} \pi \pi p, p p \rightarrow K \bar{K} \pi p p$
24 \pm 3		CHAUVAT	84	SPEC	ISR 31.5 $p p$
29 \pm 10	103	DIONISI	80	HBC	4 $\pi^- p \rightarrow K \bar{K} \pi n$
28.3 \pm 6.7	320	NACASCH	78	HBC	0.7,0.76 $\bar{p} p \rightarrow K \bar{K} 3\pi$

• • • We do not use the following data for averages, fits, limits, etc. • • •

18.2 \pm 1.2		12 SOSA	99	SPEC	$p p \rightarrow p_{\text{slow}} (K_S^0 K^+ \pi^-)$
19.4 \pm 1.5		12 SOSA	99	SPEC	$p p \rightarrow p_{\text{slow}} (K_S^0 K^- \pi^+)$
40 \pm 5		ABATZIS	94	OMEG	450 $p p \rightarrow p p 2(\pi^+ \pi^-)$
31 \pm 5		ARMSTRONG	89E	OMEG	300 $p p \rightarrow p p 2(\pi^+ \pi^-)$
41 \pm 12		ARMSTRONG	89G	OMEG	85 $\pi^+ p \rightarrow 4\pi \pi p, p p \rightarrow 4\pi p p$
17.9 \pm 10.9	60	RATH	89	MPS	21.4 $\pi^- p \rightarrow K_S^0 K_S^0 \pi^0 n$
14 \pm 20 \pm 10	16	BECKER	87	MRK3	$e^+ e^- \rightarrow \phi K \bar{K} \pi$
26 \pm 12		EVANGELIS...	81	OMEG	12 $\pi^- p \rightarrow \eta \pi^+ \pi^- \pi^- p$
25 \pm 15	200	GURTU	79	HBC	4.2 $K^- p \rightarrow n \eta 2\pi$
\sim 10		13 STANTON	79	CNTR	8.5 $\pi^- p \rightarrow n 2\gamma 2\pi$
24 \pm 18	210	GRASSLER	77	HBC	16 $\pi^\mp p$
28 \pm 5	150	14 DEFOIX	72	HBC	0.7 $\bar{p} p \rightarrow 7\pi$
46 \pm 9	180	14 DUBOC	72	HBC	1.2 $\bar{p} p \rightarrow 2K 4\pi$
37 \pm 5	500	15 THUN	72	MMS	13.4 $\pi^- p$
10 \pm 10		BOESEBECK	71	HBC	16.0 $\pi p \rightarrow p 5\pi$
30 \pm 15		CAMPBELL	69	DBC	2.7 $\pi^+ d$
60 \pm 15		14 LORSTAD	69	HBC	0.7 $\bar{p} p, 4,5\text{-body}$
35 \pm 10		14 DAHL	67	HBC	1.6–4.2 $\pi^- p$

9 The selected process is $J/\psi \rightarrow \omega a_0(980)\pi$.

10 Supersedes ABATZIS 94, ARMSTRONG 89E.

11 From partial wave analysis of $K^+ \bar{K}^0 \pi^-$ system.

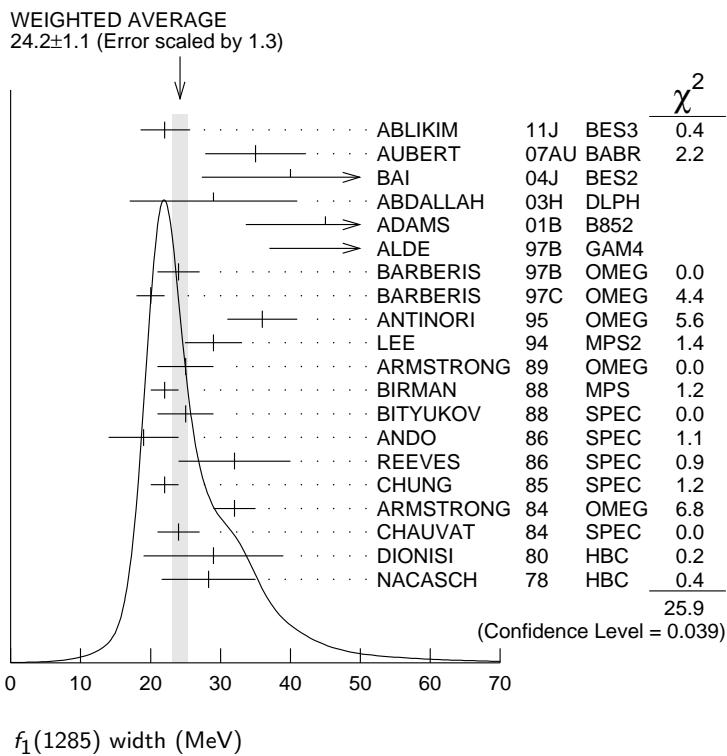
12 No systematic error given.

13 From phase shift analysis of $\eta \pi^+ \pi^-$ system.

14 Resolution is not unfolded.

15 Seen in the missing mass spectrum.

|
 NODE=M008W;LINKAGE=BL
 NODE=M008W;LINKAGE=B
 NODE=M008W;LINKAGE=A
 NODE=M008W;LINKAGE=N1
 NODE=M008W;LINKAGE=P
 NODE=M008W;LINKAGE=R
 NODE=M008W;LINKAGE=S

 $f_1(1285)$ width (MeV) **$f_1(1285)$ DECAY MODES**

NODE=M008215; NODE=M008

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
$\Gamma_1 \quad 4\pi$	$(33.1 \pm 2.1) \%$	S=1.3	DESIG=21
$\Gamma_2 \quad \pi^0 \pi^0 \pi^+ \pi^-$	$(22.0 \pm 1.4) \%$	S=1.3	DESIG=22
$\Gamma_3 \quad 2\pi^+ 2\pi^-$	$(11.0 \pm 0.7) \%$	S=1.3	DESIG=20
$\Gamma_4 \quad \rho^0 \pi^+ \pi^-$	$(11.0 \pm 0.7) \%$	S=1.3	DESIG=191
$\Gamma_5 \quad \rho^0 \rho^0$	seen		DESIG=23; OUR EST; → UNCHECKED ← DESIG=7
$\Gamma_6 \quad 4\pi^0$	$< 7 \times 10^{-4}$	CL=90%	DESIG=7
$\Gamma_7 \quad \eta \pi^+ \pi^-$	$(35 \pm 15) \%$		DESIG=198
$\Gamma_8 \quad \eta \pi \pi$	$(52.4 \pm 1.9) \%$	S=1.2	DESIG=3
$\Gamma_9 \quad a_0(980)\pi$ [ignoring $a_0(980) \rightarrow K\bar{K}$]	$(36 \pm 7) \%$		DESIG=4
$\Gamma_{10} \quad \eta \pi \pi$ [excluding $a_0(980)\pi$]	$(16 \pm 7) \%$		DESIG=5
$\Gamma_{11} \quad K\bar{K}\pi$	$(9.0 \pm 0.4) \%$	S=1.1	DESIG=1
$\Gamma_{12} \quad K\bar{K}^*(892)$	not seen		DESIG=6
$\Gamma_{13} \quad \pi^+ \pi^- \pi^0$	$(3.0 \pm 0.9) \times 10^{-3}$		DESIG=197
$\Gamma_{14} \quad \rho^\pm \pi^\mp$	$< 3.1 \times 10^{-3}$	CL=95%	DESIG=199
$\Gamma_{15} \quad \gamma \rho^0$	$(5.5 \pm 1.3) \%$	S=2.8	DESIG=13
$\Gamma_{16} \quad \phi \gamma$	$(7.4 \pm 2.6) \times 10^{-4}$		DESIG=10
$\Gamma_{17} \quad \gamma \gamma^*$			DESIG=9
$\Gamma_{18} \quad \gamma \gamma$			DESIG=8

CONSTRAINED FIT INFORMATION

An overall fit to 7 branching ratios uses 16 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 24.7$ for 12 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_9	-17			
x_{10}	-8	-95		
x_{11}	46	-9	-4	
x_{15}	-36	-4	-2	-34
	x_1	x_9	x_{10}	x_{11}

$f_1(1285) \Gamma(i) \Gamma(\gamma\gamma) / \Gamma(\text{total})$

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma) / \Gamma_{\text{total}}$		$\Gamma_8 \Gamma_{18} / \Gamma = (\Gamma_9 + \Gamma_{10}) \Gamma_{18} / \Gamma$		
VALUE (keV)	CL%	DOCUMENT ID	TECN	COMMENT
<0.62	95	GIDAL	87	MRK2 $e^+ e^- \rightarrow e^+ e^- \eta\pi^+\pi^-$

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma^*) / \Gamma_{\text{total}}$		$\Gamma_8 \Gamma_{17} / \Gamma = (\Gamma_9 + \Gamma_{10}) \Gamma_{17} / \Gamma$		
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.4 ± 0.4 OUR AVERAGE				Error includes scale factor of 1.4.
1.18 ± 0.25 ± 0.20	26	16,17 AIHARA	88B TPC	$e^+ e^- \rightarrow e^+ e^- \eta\pi^+\pi^-$
2.30 ± 0.61 ± 0.42	16,18 GIDAL	87	MRK2	$e^+ e^- \rightarrow e^+ e^- \eta\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.8 ± 0.3 ± 0.3	420	19 ACHARD	02B L3	$183-209 e^+ e^- \rightarrow e^+ e^- \eta\pi^+\pi^-$

16 Assuming a ρ -pole form factor.

17 Published value multiplied by $\eta\pi\pi$ branching ratio 0.49.

18 Published value divided by 2 and multiplied by the $\eta\pi\pi$ branching ratio 0.49.

19 Published value multiplied by the $\eta\pi\pi$ branching ratio 0.52.

$f_1(1285)$ BRANCHING RATIOS

$\Gamma(K\bar{K}\pi) / \Gamma(4\pi)$		Γ_{11} / Γ_1		
VALUE	DOCUMENT ID	TECN	COMMENT	
0.271 ± 0.016 OUR FIT			Error includes scale factor of 1.3.	
0.271 ± 0.016 OUR AVERAGE			Error includes scale factor of 1.2.	

0.265 ± 0.014	20 BARBERIS	97C OMEG 450 $p p \rightarrow p p K_S^0 K^\pm \pi^\mp$
0.28 ± 0.05	21 ARMSTRONG	89E OMEG 300 $p p \rightarrow p p f_1(1285)$
0.37 ± 0.03 ± 0.05	22 ARMSTRONG	89G OMEG 85 $\pi p \rightarrow 4\pi X$

20 Using $2(\pi^+ \pi^-)$ data from BARBERIS 97B.

21 Assuming $\rho\pi\pi$ and $a_0(980)\pi$ intermediate states.

22 4π consistent with being entirely $\rho\pi\pi$.

$\Gamma(\pi^0\pi^0\pi^+\pi^-) / \Gamma_{\text{total}}$		$\Gamma_2 / \Gamma = \frac{2}{3} \Gamma_1 / \Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT	
0.220 ± 0.014 OUR FIT			Error includes scale factor of 1.3.	

$\Gamma(2\pi^+ 2\pi^-) / \Gamma_{\text{total}}$		$\Gamma_3 / \Gamma = \frac{1}{3} \Gamma_1 / \Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT	
0.110 ± 0.007 OUR FIT			Error includes scale factor of 1.3.	

$\Gamma(\rho^0\pi^+\pi^-) / \Gamma_{\text{total}}$		$\Gamma_4 / \Gamma = \frac{1}{3} \Gamma_1 / \Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT	
0.110 ± 0.007 OUR FIT			Error includes scale factor of 1.3.	

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NODE=M008G2

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NODE=M008G3

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NODE=M008G3;LINKAGE=AC

NODE=M008220

NODE=M008R1
NODE=M008R1

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NODE=M008R1;LINKAGE=M
NODE=M008R1;LINKAGE=A

NODE=M008R18
NODE=M008R18

NODE=M008R17
NODE=M008R17

NODE=M008R19
NODE=M008R19

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2\pi^+2\pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ_3
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.0 ± 0.4	GRASSLER	77	HBC 16 GeV $\pi^\pm p$	

 $\Gamma(\rho^0\rho^0)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	COMMENT	Γ_5/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	BARBERIS	00C 450 $pp \rightarrow p_f 4\pi p_s$	NODE=M008R21 NODE=M008R21

 $\Gamma(4\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
<7	90	ALDE	87	GAM4 100 $\pi^- p \rightarrow 4\pi^0 n$	NODE=M008R8 NODE=M008R8

 $\Gamma(\pi^+\pi^-\pi^0)/\Gamma(\eta\pi^+\pi^-)$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ_7
0.86±0.16±0.20	2.3k	23 DOROFEEV	11	VES $\pi^- N \rightarrow \pi^- f_1(1285) N$	NODE=M008R02 NODE=M008R02

23 Value obtained selecting the region corresponding to $f_0(980)$ in the $\pi^+\pi^-$ mass spectrum.

 $\Gamma(\eta\pi\pi)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	$\Gamma_8/\Gamma = (\Gamma_9 + \Gamma_{10})/\Gamma$
-------	-------------	---

0.524^{+0.019}_{-0.022} OUR FIT Error includes scale factor of 1.2.

 $\Gamma(4\pi)/\Gamma(\eta\pi\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_1/\Gamma_8 = \Gamma_1/(\Gamma_9 + \Gamma_{10})$
-------	-------------	------	---------	---

0.63±0.06 OUR FIT Error includes scale factor of 1.2.

0.41±0.14 OUR AVERAGE

0.37±0.11±0.11	BOLTON	92	MRK3 $J/\psi \rightarrow \gamma f_1(1285)$
0.64±0.40	GURTU	79	HBC 4.2 $K^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.93±0.30	GRASSLER	77	HBC 16 $\pi^\mp p$

24 Assuming $\rho\pi\pi$ and $a_0(980)\pi$ intermediate states.

 $\Gamma(2\pi^+2\pi^-)/\Gamma(\eta\pi\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_8
-------	-------------	------	---------	---------------------

0.28±0.02±0.02

25 LEES	12X	BABR	$\tau^- \rightarrow \pi^- f_1(1285) \nu_\tau$
---------	-----	------	---

25 Assuming $B(f_1(1285) \rightarrow \pi\pi\eta) = 3/2 B(f_1(1285) \rightarrow \pi^+\pi^-\eta)$.

 $\Gamma(a_0(980)\pi \text{ [ignoring } a_0(980) \rightarrow K\bar{K}])/\Gamma(\eta\pi\pi)$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_9/\Gamma_8 = \Gamma_9/(\Gamma_9 + \Gamma_{10})$
-------	-----	------	-------------	------	---------	---

0.69±0.13 OUR FIT

0.69^{+0.13}_{-0.12} OUR AVERAGE

0.72±0.15	GURTU	79	HBC 4.2 $K^- p$
0.6 ^{+0.3} _{-0.2}	CORDEN	78	OMEG 12–15 $\pi^- p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

>0.69	95	318	ACHARD	02B L3	$183\text{--}209 e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$
0.28±0.07		1400	ALDE	97B GAM4	$100 \pi^- p \rightarrow \eta \pi^0 \pi^0 n$
1.0 ± 0.3			GRASSLER	77	HBC 16 $\pi^\mp p$

 $\Gamma(K\bar{K}\pi)/\Gamma(\eta\pi\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_{11}/\Gamma_8 = \Gamma_{11}/(\Gamma_9 + \Gamma_{10})$
-------	-------------	------	---------	---

0.171±0.013 OUR FIT Error includes scale factor of 1.1.

0.170±0.012 OUR AVERAGE

0.166±0.01 ± 0.008	BARBERIS	98C	OMEG 450 $pp \rightarrow p_f f_1(1285) p_s$
0.42 ± 0.15	GURTU	79	HBC 4.2 $K^- p$
0.5 ± 0.2	26 CORDEN	78	OMEG 12–15 $\pi^- p$
0.20 ± 0.08	27 DEFOIX	72	HBC 0.7 $\bar{p}p \rightarrow 7\pi$
0.16 ± 0.08	CAMPBELL	69	DBC 2.7 $\pi^+ d$

26 CORDEN 78 assumes low-mass $\eta\pi\pi$ region is dominantly 1^{++} . See BARBERIS 98C and MANAK 00A for discussion.

27 $K\bar{K}$ system characterized by the $I = 1$ threshold enhancement. (See under $a_0(980)$).

NODE=M008R6

NODE=M008R6

NODE=M008R21

NODE=M008R21

NODE=M008R8

NODE=M008R8

NODE=M008R02

NODE=M008R02

NODE=M008R02;LINKAGE=DO

NODE=M008R22

NODE=M008R22

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NODE=M008R04

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NODE=M008R3

NODE=M008R3

NODE=M008R2

NODE=M008R2

NODE=M008R2;LINKAGE=CD

NODE=M008R2;LINKAGE=K

$\Gamma(K\bar{K}^*(892))/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
not seen	NACASCH 78	HBC	$0.7, 0.76 \bar{p}p \rightarrow K\bar{K}3\pi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				

seen 28 ACHARD 07 L3 $183-209 e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$

28 A clear signal of 19.8 ± 4.4 events observed at high Q^2 .

 $\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
0.30±0.055±0.074	2.3k	29 DOROFEEV	11 VES	$\pi^- N \rightarrow \pi^- f_1(1285) N$	
29 Value obtained selecting the region corresponding to $f_0(980)$ in the $\pi^+\pi^-$ mass spectrum. The systematic error includes the uncertainty on the partial width $f_1 \rightarrow \eta\pi\pi$ obtained from PDG 10 data.					

 $\Gamma(\rho^\pm\pi^\mp)/\Gamma_{\text{total}}$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{14}/Γ
<0.31	95	DOROFEEV	11 VES	$\pi^- N \rightarrow \pi^- f_1(1285) N$	

 $\Gamma(\gamma\rho^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{15}/Γ
5.5±1.3 OUR FIT	Error includes scale factor of 2.8.				
2.8±0.7±0.6	AMELIN 95 VES	37	$\pi^- N \rightarrow \pi^-\pi^+\pi^-\gamma N$		
• • • We do not use the following data for averages, fits, limits, etc. • • •					

<5 95 BITYUKOV 91B SPEC $32 \pi^- p \rightarrow \pi^+\pi^-\gamma n$

 $\Gamma(\gamma\rho^0)/\Gamma(2\pi^+2\pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_{15}/\Gamma_3 = \Gamma_{15}/\frac{1}{3}\Gamma_1$
0.50±0.13 OUR FIT	Error includes scale factor of 2.5.			
0.45±0.18	30 COFFMAN 90 MRK3 $J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$			

30 Using $B(J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma\gamma\rho^0) = 0.25 \times 10^{-4}$ and $B(J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma 2\pi^+ 2\pi^-) = 0.55 \times 10^{-4}$ given by MIR 88.

 $\Gamma(\eta\pi\pi)/\Gamma(\gamma\rho^0)$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_8/\Gamma_{15} = (\Gamma_9 + \Gamma_{10})/\Gamma_{15}$
9.5±2.0 OUR FIT	Error includes scale factor of 2.5.			
7.9±0.9 OUR AVERAGE				

10.0±1.0±2.0 BARBERIS 98C OMEG 450 $p\bar{p} \rightarrow p_f f_1(1285) p_s$
7.5±1.0 31 ARMSTRONG 92C OMEG 300 $p\bar{p} \rightarrow pp\pi^+\pi^-\gamma, pp\eta\pi^+\pi^-$

31 Published value multiplied by 1.5.

 $\Gamma(\gamma\rho^0)/\Gamma(K\bar{K}\pi)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{15}/Γ_{11}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>0.035 90 32 COFFMAN 90 MRK3 $J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$					

32 Using $B(J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma\gamma\rho^0) = 0.25 \times 10^{-4}$ and $B(J/\psi \rightarrow \gamma f_1(1285) \rightarrow \gamma K\bar{K}\pi) < 0.72 \times 10^{-3}$.

 $\Gamma(\phi\gamma)/\Gamma(K\bar{K}\pi)$

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{16}/Γ_{11}
0.82±0.21±0.20	19		BITYUKOV 88	SPEC	$32.5 \pi^- p \rightarrow K^+ K^- \pi^0 n$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						

<0.50 95 BARBERIS 98C OMEG 450 $p\bar{p} \rightarrow p_f f_1(1285) p_s$
<0.93 95 AMELIN 95 VES 37 $\pi^- N \rightarrow \pi^-\pi^+\pi^-\gamma N$

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NODE=M008R5

NODE=M008R5;LINKAGE=CH

NODE=M008R01
NODE=M008R01

NODE=M008R01;LINKAGE=DO

NODE=M008R03
NODE=M008R03

NODE=M008R15
NODE=M008R15

NODE=M008R13
NODE=M008R13

NODE=M008R13;LINKAGE=E

NODE=M008R16
NODE=M008R16

NODE=M008R12;LINKAGE=F

NODE=M008R9
NODE=M008R9

f₁(1285) REFERENCES

				NODE=M008
LEES	12X	PR D86 092010	J.P. Lees <i>et al.</i>	REFID=54714
ABLIKIM	11J	PRL 107 182001	M. Ablikim <i>et al.</i>	REFID=53931
DOROFEEV	11	EPJ A47 68	V. Dorofeev <i>et al.</i>	REFID=16755
PDG	10	JPG 37 075021	K. Nakamura <i>et al.</i>	REFID=53229
ACHARD	07	JHEP 0703 018	P. Achard <i>et al.</i>	REFID=51698
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	REFID=52049
BAI	04J	PL B594 47	J.Z. Bai <i>et al.</i>	REFID=50167
ABDALLAH	03H	PL B569 129	J. Abdallah <i>et al.</i>	REFID=49548
ACHARD	02B	PL B526 269	P. Achard <i>et al.</i>	REFID=48574
ACCIARRI	01G	PL B501 1	M. Acciari <i>et al.</i>	REFID=48319
ADAMS	01B	PL B516 264	G.S. Adams <i>et al.</i>	REFID=49649
BARBERIS	00C	PL B471 440	D. Barberis <i>et al.</i>	REFID=47959
MANAK	00A	PR D62 012003	J.J. Manak <i>et al.</i>	REFID=47989
SOSA	99	PRL 83 913	M. Sosa <i>et al.</i>	REFID=46937
BARBERIS	98C	PL B440 225	D. Barberis <i>et al.</i>	REFID=46346
ALDE	97B	PAN 60 386	D. Alde <i>et al.</i>	REFID=45396
		Translated from YAF 60 458.		
BARBERIS	97B	PL B413 217	D. Barberis <i>et al.</i>	REFID=45758
BARBERIS	97C	PL B413 225	D. Barberis <i>et al.</i>	REFID=45759
AMELIN	95	ZPHY C66 71	D.V. Amelin <i>et al.</i>	REFID=44376
ANTINORI	95	PL B353 589	F. Antinori <i>et al.</i>	REFID=44437
ABATZIS	94	PL B324 509	S. Abatzis <i>et al.</i>	REFID=44090
LEE	94	PL B323 227	J.H. Lee <i>et al.</i>	REFID=44092
ARMSTRONG	93C	PL B307 394	T.A. Armstrong <i>et al.</i>	REFID=43587
ARMSTRONG	92C	ZPHY C54 371	T.A. Armstrong <i>et al.</i>	REFID=42097
BOLTON	92	PL B278 495	T. Bolton <i>et al.</i>	REFID=42175
BITYUKOV	91B	SJNP 54 318	S.I. Bityukov <i>et al.</i>	REFID=41864
		Translated from YAF 54 529.	(SERP)	
FUKUI	91C	PL B267 293	S. Fukui <i>et al.</i>	REFID=41748
COFFMAN	90	PR D41 1410	D.M. Coffman <i>et al.</i>	REFID=41350
ARMSTRONG	89	PL B221 216	T.A. Armstrong <i>et al.</i>	REFID=40729
ARMSTRONG	89E	PL B228 536	T.A. Armstrong, M. Benayoun	REFID=41011
ARMSTRONG	89G	ZPHY C43 55	T.A. Armstrong <i>et al.</i>	REFID=40930
RATH	89	PR D40 693	M.G. Rath <i>et al.</i>	REFID=40924
AIHARA	88B	PL B209 107	H. Aihara <i>et al.</i>	REFID=40572
BIRMAN	88	PRL 61 1557	A. Birman <i>et al.</i>	REFID=40568
BITYUKOV	88	PL B203 327	S.I. Bityukov <i>et al.</i>	REFID=40569
MIR	88	Photon-Photon 88, 126	R. Mir	REFID=41574
Conference				
ALDE	87	PL B198 286	D.M. Alde <i>et al.</i>	REFID=40221
BECKER	87	PRL 59 186	J.J. Becker <i>et al.</i>	REFID=40015
GIDAL	87	PRL 59 2012	G. Gidal <i>et al.</i>	REFID=40223
ANDO	86	PRL 57 1296	A. Ando <i>et al.</i>	REFID=20891
REEVES	86	PR D34 1960	D.F. Reeves <i>et al.</i>	REFID=20936
CHUNG	85	PRL 55 779	S.U. Chung <i>et al.</i>	REFID=20934
ARMSTRONG	84	PL 146B 273	T.A. Armstrong <i>et al.</i>	REFID=20929
BITYUKOV	84B	PL 144B 133	S.I. Bityukov <i>et al.</i>	REFID=20468
CHAUVAT	84	PL 148B 382	P. Chauvat <i>et al.</i>	REFID=20932
TORNQVIST	82B	NP B203 268	N.A. Tornqvist	REFID=20573
EVANGELIS...	81	NP B178 197	C. Evangelista <i>et al.</i>	REFID=20462
BROMBERG	80	PR D22 1513	C.M. Bromberg <i>et al.</i>	REFID=20922
DIONISI	80	NP B169 1	C. Dionisi <i>et al.</i>	REFID=20924
GURTU	79	NP B151 181	A. Gurtu <i>et al.</i>	REFID=20456
STANTON	79	PRL 42 346	N.R. Stanton <i>et al.</i>	REFID=20456
CORDEN	78	NP B144 253	M.J. Corden <i>et al.</i>	REFID=20452
NACASCH	78	NP B135 203	R. Nacash <i>et al.</i>	REFID=20919
GRASSLER	77	NP B121 189	H. Grassler <i>et al.</i>	REFID=20447
DEFOIX	72	NP B44 125	C. Defoix <i>et al.</i>	REFID=20435
DUBOC	72	NP B46 429	J. Duboc <i>et al.</i>	REFID=20339
THUN	72	PRL 28 1733	R. Thun <i>et al.</i>	REFID=20911
BARDADIN...	71	PR D4 2711	M. Bardadin-Otwinowska <i>et al.</i>	REFID=20196
BOESEBECK	71	PL 34B 659	K. Boesebeck (AACH, BERL, BONN, CERN, CRAC+)	REFID=20905
CAMPBELL	69	PRL 22 1204	J.H. Campbell <i>et al.</i>	REFID=20419
LORSTAD	69	NP B14 63	B. Lorstad <i>et al.</i>	REFID=20901
D'ANDLAU	68	NP B5 693	C. d'Andlau <i>et al.</i>	REFID=20897
DAHL	67	PR 163 1377	O.I. Dahl <i>et al.</i>	REFID=20321

$\eta(1295)$ $I^G(J^{PC}) = 0^+(0^-+)$ See also the mini-review under $\eta(1405)$

NODE=M037

NODE=M037

NODE=M037M

NODE=M037M

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1294±4 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.				
1302±9±8	20k	ADAMS	01B B852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
1282±5	9082	MANAK	00A MPS	18 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$
1299±4	2100	ALDE	97B GAM4	100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$
1295±4		FUKUI	91C SPEC	8.95 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1264±8	¹ AUGUSTIN	90	DM2	$J/\psi \rightarrow \gamma \eta \pi^+ \pi^-$
~1275	STANTON	79	CNTR	8.4 $\pi^- p \rightarrow n \eta 2\pi$

WEIGHTED AVERAGE
1294±4 (Error scaled by 1.6)

 $\eta(1295)$ mass (MeV)

¹ PWA analysis of AUGUSTIN 92 assigns 0^{-+} quantum numbers to this state rather than 1^{++} as before.

NODE=M037M;LINKAGE=AG

 $\eta(1295)$ WIDTH

NODE=M037W

NODE=M037W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
55± 5 OUR AVERAGE				
57±23±21	20k	ADAMS	01B B852	18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$
66±13	9082	MANAK	00A MPS	18 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$
53± 6		FUKUI	91C SPEC	8.95 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<40	2100	ALDE	97B GAM4	100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$
44±20		² AUGUSTIN	90	DM2 $J/\psi \rightarrow \gamma \eta \pi^+ \pi^-$
~70		STANTON	79	CNTR 8.4 $\pi^- p \rightarrow n \eta 2\pi$

² PWA analysis of AUGUSTIN 92 assigns 0^{-+} quantum numbers to this state rather than 1^{++} as before.

NODE=M037W;LINKAGE=AG

$\eta(1295)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \eta\pi^+\pi^-$	seen
$\Gamma_2 a_0(980)\pi$	seen
$\Gamma_3 \gamma\gamma$	
$\Gamma_4 \eta\pi^0\pi^0$	seen
$\Gamma_5 \eta(\pi\pi)S\text{-wave}$	seen
$\Gamma_6 \sigma\eta$	
$\Gamma_7 K\bar{K}\pi$	

$\eta(1295) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\eta\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_1\Gamma_3/\Gamma$
<u>VALUE (keV)</u>	<u>CL%</u>
<0.066	95
AIHARA	ACCIARRI
88C	01G
TPC	L3
$e^+e^- \rightarrow e^+e^- \eta\pi^+\pi^-$	$183-202 e^+e^- \rightarrow e^+e^- \eta\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.6	90
ANTREASYAN 87	AIHARA
CBAL	88C
$e^+e^- \rightarrow e^+e^- \eta\pi\pi$	$e^+e^- \rightarrow e^+e^- \eta\pi\pi$

$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_7\Gamma_3/\Gamma$
<u>VALUE (keV)</u>	<u>CL%</u>
<0.014	90
AHOHE	3,4
90	3,4
CLE2	AHOHE
$e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$	$10.6 e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$
• • • We do not use the following data for averages, fits, limits, etc. • • •	

3 Using $\eta(1295)$ mass and width 1294 MeV and 55 MeV, respectively.

4 Assuming three-body phase-space decay to $K_S^0 K^\pm \pi^\mp$.

$\Gamma(a_0(980)\pi)/\Gamma_{\text{total}}$	Γ_2/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
not seen	BERTIN
	97
	OBLX
	$0.0 \bar{p}p \rightarrow K^\pm(K^0)\pi^\mp\pi^+\pi^-$
seen	BIRMAN
	88
	MPS
	$8 \pi^- p \rightarrow K^+K^0\pi^-n$
large	ANDO
large	STANTON
	86
	SPEC
	$8 \pi^- p \rightarrow \eta\pi^+\pi^-n$
	79
	CNTR
	$8.4 \pi^- p \rightarrow n\eta 2\pi$

$\Gamma(a_0(980)\pi)/\Gamma(\eta\pi^0\pi^0)$	Γ_2/Γ_4
<u>VALUE</u>	<u>DOCUMENT ID</u>
0.65±0.10	5 ALDE
	97B
	GAM4
	$100 \pi^- p \rightarrow \eta\pi^0\pi^0n$

5 Assuming that $a_0(980)$ decays only to $\eta\pi$.

$\Gamma(\eta\pi\pi)S\text{-wave})/\Gamma(\eta\pi^0\pi^0)$	Γ_5/Γ_4
<u>VALUE</u>	<u>DOCUMENT ID</u>
0.35±0.10	ALDE
	97B
	GAM4
	$100 \pi^- p \rightarrow \eta\pi^0\pi^0n$

$\Gamma(a_0(980)\pi)/\Gamma(\sigma\eta)$	Γ_2/Γ_6
<u>VALUE</u>	<u>EVTS</u>
0.48±0.22	9082
	MANAK
	00A
	MPS
	$18 \pi^- p \rightarrow \eta\pi^+\pi^-n$

$\eta(1295)$ REFERENCES

AHOHE	05	PR D71 072001	R. Ahohe <i>et al.</i>	(CLEO Collab.)
ACCIARRI	01G	PL B501 1	M. Acciarri <i>et al.</i>	(L3 Collab.)
ADAMS	01B	PL B516 264	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)
MANAK	00A	PR D62 012003	J.J. Manak <i>et al.</i>	(BNL E852 Collab.)
ALDE	97B	PAN 60 386	D. Alde <i>et al.</i>	(GAMS Collab.)
		Translated from YAF 60 458.		
BERTIN	97	PL B400 226	A. Bertin <i>et al.</i>	(OBELIX Collab.)
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)
FUKUI	91C	PL B267 293	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+) (SUGI, NAGO, KEK, KYOT+)
AUGUSTIN	90	PR D42 10	J.E. Augustin <i>et al.</i>	(DM2 Collab.)
AIHARA	88C	PR D38 1	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)
BIRMAN	88	PRL 61 1557	A. Birman <i>et al.</i>	(BNL, FSU, IND, MASD) JP
ANTREASYAN	87	PR D36 2633	D. Antreasyan <i>et al.</i>	(Crystal Ball Collab.)
ANDO	86	PRL 57 1296	A. Ando <i>et al.</i>	(KEK, KYOT, NIIRS, SAGA+) JP
STANTON	79	PRL 42 346	N.R. Stanton <i>et al.</i>	(OSU, CARL, MCGI+) JP

NODE=M037215;NODE=M037

DESIG=2;OUR EST;→ UNCHECKED ←
 DESIG=1;OUR EST;→ UNCHECKED ←
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 DESIG=4;OUR EST;→ UNCHECKED ←
 DESIG=5;OUR EST;→ UNCHECKED ←
 DESIG=6
 DESIG=7

NODE=M037220

NODE=M037G2
 NODE=M037G2

NODE=M037G3
 NODE=M037G3

NODE=M037G3;LINKAGE=AH
 NODE=M037G3;LINKAGE=B3

NODE=M037225

NODE=M037R1
 NODE=M037R1

NODE=M037R2
 NODE=M037R2

NODE=M037R2;LINKAGE=A

NODE=M037R4
 NODE=M037R4

NODE=M037R5
 NODE=M037R5

NODE=M037

REFID=50764
 REFID=48319
 REFID=49649
 REFID=47989
 REFID=45396
 REFID=45417
 REFID=41584
 REFID=41748
 REFID=41352
 REFID=40564
 REFID=40568
 REFID=40008
 REFID=20891
 REFID=20887

$\pi(1300)$

 $I^G(J^{PC}) = 1^-(0^-+)$

$\pi(1300)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1300±100 OUR ESTIMATE				

• • • We do not use the following data for averages, fits, limits, etc. • • •

1345± 8±10	18k	¹ SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
1200± 40	90k	SALVINI 04	OBLX	$\bar{p}p \rightarrow 2\pi^+ 2\pi^-$
1343± 15±24		CHUNG 02	B852	$18.3 \pi^- p \rightarrow \pi^+\pi^-\pi^- p$
1375± 40		ABELE 01	CBAR	$0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$
1275± 15		BERTIN 97D	OBLX	$0.05 \bar{p}p \rightarrow 2\pi^+ 2\pi^-$
~ 1114		ABELE 96	CBAR	$0.0 \bar{p}p \rightarrow 5\pi^0$
1190± 30		ZIELINSKI 84	SPEC	$200 \pi^+ Z \rightarrow Z 3\pi$
1240± 30		BELLINI 82	SPEC	$40 \pi^- A \rightarrow A 3\pi$
1273± 50		² AARON 81	RVUE	
1342± 20		BONESINI 81	OMEG	$12 \pi^- p \rightarrow p 3\pi$
~ 1400		DAUM 81B	SPEC	$63.94 \pi^- p$

¹ From analysis of L3 data at 183–209 GeV.

² Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from DAUM 80 and DANKOWYCH 81.

NODE=M058M

NODE=M058M

→ UNCHECKED ←

$\pi(1300)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
200 to 600 OUR ESTIMATE				

• • • We do not use the following data for averages, fits, limits, etc. • • •

260± 20±30	18k	³ SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
470±120	90k	SALVINI 04	OBLX	$\bar{p}p \rightarrow 2\pi^+ 2\pi^-$
449± 39±47		CHUNG 02	B852	$18.3 \pi^- p \rightarrow \pi^+\pi^-\pi^- p$
268± 50		ABELE 01	CBAR	$0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$
218±100		BERTIN 97D	OBLX	$0.05 \bar{p}p \rightarrow 2\pi^+ 2\pi^-$
~ 340		ABELE 96	CBAR	$0.0 \bar{p}p \rightarrow 5\pi^0$
440± 80		ZIELINSKI 84	SPEC	$200 \pi^+ Z \rightarrow Z 3\pi$
360±120		BELLINI 82	SPEC	$40 \pi^- A \rightarrow A 3\pi$
580±100		⁴ AARON 81	RVUE	
220± 70		BONESINI 81	OMEG	$12 \pi^- p \rightarrow p 3\pi$
~ 600		DAUM 81B	SPEC	$63.94 \pi^- p$

³ From analysis of L3 data at 183–209 GeV.

⁴ Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from DAUM 80 and DANKOWYCH 81.

NODE=M058M;LINKAGE=SC

NODE=M058M;LINKAGE=E

NODE=M058W

NODE=M058W

→ UNCHECKED ←

$\pi(1300)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \rho\pi$	seen
$\Gamma_2 \pi(\pi\pi)_{S\text{-wave}}$	seen
$\Gamma_3 \gamma\gamma$	

NODE=M058W;LINKAGE=SC

NODE=M058W;LINKAGE=E

NODE=M058215;NODE=M058

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=3;OUR EST;→ UNCHECKED ←
DESIG=4

NODE=M058218

NODE=M058G1

NODE=M058G1

NODE=M058G1;LINKAGE=SC

$\Gamma(\rho\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_1\Gamma_3/\Gamma$			
VALUE (keV)	CL%	DOCUMENT ID	TECN	COMMENT
<0.085	90	ACCIARRI 97T	L3	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.8	95	⁵ SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
<0.54	90	ALBRECHT 97B	ARG	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$

⁵ From analysis of L3 data at 183–209 GeV.

$\pi(1300)$ BRANCHING RATIOS

$\Gamma(\pi(\pi\pi)S\text{-wave})/\Gamma(\rho\pi)$			Γ_2/Γ_1		
VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.2 ± 0.4		90k	SALVINI	04	OBLX $\bar{p}p \rightarrow 2\pi^+ 2\pi^-$
seen			CHUNG	02	B852 $18.3 \pi^- p \rightarrow \pi^+ 2\pi^- p$
<0.15		90	ABELE	01	CBAR $0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$
2.12		6	AARON	81	RVUE

⁶ Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from DAUM 80 and DANKOWYCH 81.

NODE=M058220

NODE=M058R1
NODE=M058R1

$\pi(1300)$ REFERENCES

SCHEGELSKY	06	EPJ A27 199	V.A. Schegelsky et al.	
SALVINI	04	EPJ C35 21	P. Salvini et al.	(OBELIX Collab.)
CHUNG	02	PR D65 072001	S.U. Chung et al.	(BNL E852 Collab.)
ABELE	01	EPJ C19 667	A. Abele et al.	(Crystal Barrel Collab.)
ACCIARRI	97T	ZPHY C74 469	M. Acciarri et al.	(L3 Collab.)
ALBRECHT	97B	ZPHY C74 469	H. Albrecht et al.	(ARGUS Collab.)
BERTIN	97D	PL B414 220	A. Bertin et al.	(OBELIX Collab.)
ABELE	96	PL B380 453	A. Abele et al.	(Crystal Barrel Collab.)
ZIELINSKI	84	PR D30 1855	M. Zielinski et al.	(ROCH, MINN, FNAL)
BELLINI	82	PRL 48 1697	G. Bellini et al.	(MILA, BGNA, JINR)
AARON	81	PR D24 1207	R.A. Aaron, R.S. Longacre	(NEAS, BNL)
BONESINI	81	PL 103B 75	M. Bonesini et al.	(MILA, LIVP, DARE+)
DANKOWYCH	81	PRL 46 580	J.A. Dankowych et al.	(TNTO, BNL, CARL+)
DAUM	81B	NP B182 269	C. Daum et al.	(AMST, CERN, CRAC, MPIM+)
DAUM	80	PL 89B 281	C. Daum et al.	(AMST, CERN, CRAC, MPIM+)
BOWLER	75	NP B97 227	M.G. Bowler et al.	(OXFTP, DARE)

NODE=M058R1;LINKAGE=E

NODE=M058

REFID=51186
REFID=53226
REFID=48837
REFID=48334
REFID=45761
REFID=45418
REFID=45763
REFID=45011
REFID=20881
REFID=21134
REFID=20870
REFID=21130
REFID=20572
REFID=20872
REFID=20868
REFID=20571

NODE=M012

 $a_2(1320)$
 $I^G(J^{PC}) = 1^-(2^{++})$

$a_2(1320)$ MASS

VALUE (MeV)	DOCUMENT ID
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1318.3^{+0.5}_{-0.6} OUR AVERAGE Includes data from the 4 datablocks that follow this one.
Error includes scale factor of 1.2.

NODE=M012205

NODE=M012M0

3 π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
The data in this block is included in the average printed for a previous datablock.					

NODE=M012M1
NODE=M012M1

1319.0^{+ 1.0}_{- 1.3} OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.

1321 ± 1	⁺⁰ ₋₇	420k	ALEKSEEV	10	COMP	$190 \pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
1326 ± 2	± 2	CHUNG	02	B852		$18.3 \pi^- p \rightarrow \pi^+ \pi^- \pi^- p$
1317 ± 3		BARBERIS	98B			$450 pp \rightarrow p_f \pi^+ \pi^- \pi^0 p_s$
1323 ± 4	± 3	ACCIARRI	97T	L3		$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$
1320 ± 7		ALBRECHT	97B	ARG		$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$
1311.3 ± 1.6 ± 3.0	72.4k	AMELIN	96	VES		$36 \pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$
1310 ± 5		ARMSTRONG	90	OMEG 0		$300.0 pp \rightarrow p p \pi^+ \pi^- \pi^0$
1323.8 ± 2.3	4022	AUGUSTIN	89	DM2	±	$J/\psi \rightarrow \rho^\pm a_2^\mp$
1320.6 ± 3.1	3562	AUGUSTIN	89	DM2	0	$J/\psi \rightarrow \rho^0 a_2^0$
1317 ± 2	25k	¹ DAUM	80C	SPEC	—	$63.94 \pi^- p \rightarrow 3\pi p$
1320 ± 10	1097	¹ BALTAY	78B	HBC	+0	$15 \pi^+ p \rightarrow p 4\pi$
1306 ± 8		FERRERSORIA	78	OMEG	—	$9 \pi^- p \rightarrow p 3\pi$
1318 ± 7	1.6k	¹ EMMS	75	DBC	0	$4 \pi^+ n \rightarrow p (3\pi)^0$
1315 ± 5		¹ ANTIFOV	73C	CNTR	—	$25.40 \pi^- p \rightarrow p \eta \pi^-$
1306 ± 9	1580	CHALOUPKA	73	HBC	—	$3.9 \pi^- p \rightarrow$

OCCUR=2

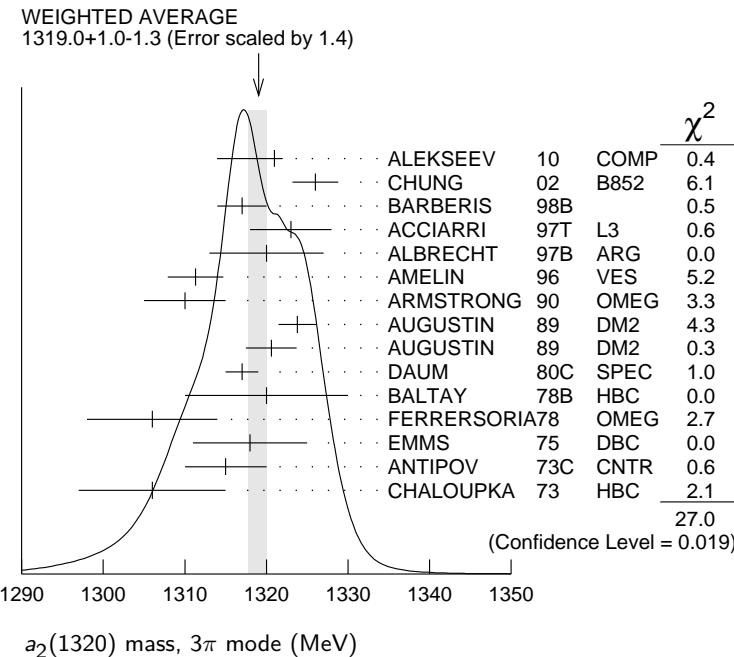
• • • We do not use the following data for averages, fits, limits, etc. • • •

1300	± 2	± 4	18k	² SCHEGELSKY	06	RVUE	0	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$
1305	± 14			CONDOD	93	SHF		$\gamma p \rightarrow n \pi^+ \pi^+ \pi^-$
1310	± 2			¹ EVANGELIS...	81	OMEG	-	$12 \pi^- p \rightarrow 3\pi p$
1343	± 11		490	BALTAY	78B	HBC	0	$15 \pi^+ p \rightarrow \Delta 3\pi$
1309	± 5		5k	BINNIE	71	MMS	-	$\pi^- p$ near a_2 thresh- old
1299	± 6		28k	BOWEN	71	MMS	-	$5 \pi^- p$
1300	± 6		24k	BOWEN	71	MMS	+	$5 \pi^+ p$
1309	± 4		17k	BOWEN	71	MMS	-	$7 \pi^- p$
1306	± 4		941	ALSTON-...	70	HBC	+	$7.0 \pi^+ p \rightarrow 3\pi p$

¹ From a fit to $J^P = 2^+$ $\rho\pi$ partial wave.

² From analysis of L3 data at 183–209 GeV.

NODE=M012M1;LINKAGE=P
NODE=M012M1;LINKAGE=SC



KK MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

NODE=M012M2
NODE=M012M2

1318.1 \pm 0.7 OUR AVERAGE

1319	± 5	4700	^{3,4} CLELAND	82B	SPEC	+	$50 \pi^+ p \rightarrow K_S^0 K^+ p$	OCCUR=2
1324	± 6	5200	^{3,4} CLELAND	82B	SPEC	-	$50 \pi^- p \rightarrow K_S^0 K^- p$	OCCUR=3
1320	± 2	4000	CHABAUD	80	SPEC	-	$17 \pi^- A \rightarrow K_S^0 K^- A$	
1312	± 4	11000	CHABAUD	78	SPEC	-	$9.8 \pi^- p \rightarrow K^- K_S^0 p$	
1316	± 2	4730	CHABAUD	78	SPEC	-	$18.8 \pi^- p \rightarrow K^- K_S^0 p$	OCCUR=2
1318	± 1		^{3,5} MARTIN	78D	SPEC	-	$10 \pi^- p \rightarrow K_S^0 K^- p$	
1320	± 2	2724	MARGULIE	76	SPEC	-	$23 \pi^- p \rightarrow K^- K_S^0 p$	
1313	± 4	730	FOLEY	72	CNTR	-	$20.3 \pi^- p \rightarrow K^- K_S^0 p$	
1319	± 3	1500	⁵ GRAYER	71	ASPK	-	$17.2 \pi^- p \rightarrow K^- K_S^0 p$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

1304	± 10	870	⁶ SCHEGELSKY	06A	RVUE	0	$\gamma\gamma \rightarrow K_S^0 K_S^0$
1330	± 11	1000	^{3,4} CLELAND	82B	SPEC	+	$30 \pi^+ p \rightarrow K_S^0 K^+ p$
1324	± 5	350	HYAMS	78	ASPK	+	$12.7 \pi^+ p \rightarrow K^+ K_S^0 p$

³ From a fit to $J^P = 2^+$ partial wave.

⁴ Number of events evaluated by us.

⁵ Systematic error in mass scale subtracted.

⁶ From analysis of L3 data at 91 and 183–209 GeV.

NODE=M012M2;LINKAGE=P
NODE=M012M2;LINKAGE=W
NODE=M012M2;LINKAGE=S
NODE=M012M2;LINKAGE=SC

$\eta\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

1317.7±1.4 OUR AVERAGE

1308 ± 9	BARBERIS	00H	450	$p p \rightarrow p_f \eta \pi^0 p_s$	
1316 ± 9	BARBERIS	00H	450	$p p \rightarrow \Delta_f^{++} \eta \pi^- p_s$	OCCUR=2
1317 ± 1 ± 2	THOMPSON	97 MPS	18	$\pi^- p \rightarrow \eta \pi^- p$	
1315 ± 5 ± 2	AMSLER	94D CBAR	0.0	$\bar{p} p \rightarrow \pi^0 \pi^0 \eta$	
1325.1±5.1	AOYAGI	93 BKEI		$\pi^- p \rightarrow \eta \pi^- p$	
1317.7±1.4±2.0	BELADIDZE	93 VES	37	$\pi^- N \rightarrow \eta \pi^- N$	
1323 ± 8 1000	KEY	73 OSPK -	6	$\pi^- p \rightarrow p \pi^- \eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1309 ± 4	ANISOVICH	09 RVUE		$\bar{p} p, \pi N$	
1324 ± 5	ARMSTRONG	93C E760 0		$\bar{p} p \rightarrow \pi^0 \eta \eta \rightarrow 6\gamma$	
1336.2±1.7 2561	DELFOSSÉ	81 SPEC +		$\pi^\pm p \rightarrow p \pi^\pm \eta$	
1330.7±2.4 1653	DELFOSSÉ	81 SPEC -		$\pi^\pm p \rightarrow p \pi^\pm \eta$	OCCUR=2
1324 ± 8 6200	CONFORTO	73 OSPK -	6	$\pi^- p \rightarrow p MM^-$	

7 The systematic error of 2 MeV corresponds to the spread of solutions.

8 Error includes 5 MeV systematic mass-scale error.

9 Missing mass with enriched MMS = $\eta \pi^-$, $\eta = 2\gamma$.

 $\eta'\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

1322 ± 7 OUR AVERAGE

1318 ± 8 +3 -5	IVANOV	01 B852	18	$\pi^- p \rightarrow \eta' \pi^- p$	
1327.0±10.7	BELADIDZE	93 VES	37	$\pi^- N \rightarrow \eta' \pi^- N$	

 $a_2(1320)$ WIDTH

NODE=M012M4

NODE=M012M4

 3π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
-------------	------	-------------	------	-----	---------

105.0+ 1.6 OUR AVERAGE

110 ± 2 +2 -15 420k	ALEKSEEV	10 COMP	190	$\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$	
108 ± 3 ± 15	CHUNG	02 B852	18.3	$\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$	
120 ± 10	BARBERIS	98B	450	$p p \rightarrow p_f \pi^+ \pi^- \pi^0 p_s$	
105 ± 10 ± 11	ACCIARRI	97T L3	$e^+ e^- \rightarrow$	$e^+ e^- \pi^+ \pi^- \pi^0$	
120 ± 10	ALBRECHT	97B ARG	$e^+ e^- \rightarrow$	$e^+ e^- \pi^+ \pi^- \pi^0$	
103.0± 6.0± 3.3 72.4k	AMELIN	96 VES	36	$\pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$	
120 ± 10	ARMSTRONG	90 OMEG 0	300.0	$p p \rightarrow p p \pi^+ \pi^- \pi^0$	
107.0± 9.7 4022	AUGUSTIN	89 DM2 ±	$J/\psi \rightarrow \rho^\pm a_2^\mp$		
118.5±12.5 3562	AUGUSTIN	89 DM2 0	$J/\psi \rightarrow \rho^0 a_2^0$		OCCUR=2
97 ± 5	EVANGELIS...	81 OMEG -	12	$\pi^- p \rightarrow 3\pi p$	
96 ± 9 25k	DAUM	80C SPEC -	63,94	$\pi^- p \rightarrow 3\pi p$	
110 ± 15 1097	BALTAY	78B HBC +0	15	$\pi^+ p \rightarrow p 4\pi$	
112 ± 18 1.6k	EMMS	75 DBC 0	4	$\pi^+ n \rightarrow p (3\pi)^0$	
122 ± 14 1.2k 10,11	WAGNER	75 HBC 0	7	$\pi^+ p \rightarrow \Delta^{++} (3\pi)^0$	
115 ± 15	ANTIPOV	73C CNTR -	25,40	$\pi^- p \rightarrow p \eta \pi^-$	
99 ± 15 1580	CHALOUPKA	73 HBC -		3.9 $\pi^- p$	
105 ± 5 28k	BOWEN	71 MMS -		5 $\pi^- p$	
99 ± 5 24k	BOWEN	71 MMS +		5 $\pi^+ p$	OCCUR=2
103 ± 5 17k	BOWEN	71 MMS -		7 $\pi^- p$	OCCUR=3

• • • We do not use the following data for averages, fits, limits, etc. • • •

117	± 6	±20	18k	12	SCHEGELSKY	06	RVUE	0	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$
120	±40				COND0	93	SHF		$\gamma p \rightarrow n\pi^+ \pi^+ \pi^-$
115	±14		490		BALTA0	78B	HBC	0	15 $\pi^+ p \rightarrow \Delta 3\pi$
72	±16		5k		BINNIE	71	MMS	-	$\pi^- p$ near a_2 thresh-old
79	±12		941		ALSTON...	70	HBC	+	7.0 $\pi^+ p \rightarrow 3\pi p$

10 From a fit to $J^P = 2^+$ $\rho\pi$ partial wave.

11 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

12 From analysis of L3 data at 183–209 GeV.

$K\bar{K}$ AND $\eta\pi$ MODES

VALUE (MeV) DOCUMENT ID

107 ±5 OUR ESTIMATE

110.4±1.7 OUR AVERAGE Includes data from the 2 datablocks that follow this one.

$K\bar{K}$ MODE

VALUE (MeV) EVTS DOCUMENT ID TECN CHG COMMENT

The data in this block is included in the average printed for a previous datablock.

109.8± 2.4 OUR AVERAGE

112	± 20	4700	13,14	CLELAND	82B	SPEC	+	50 $\pi^+ p \rightarrow K_S^0 K^+ p$
120	± 25	5200	13,14	CLELAND	82B	SPEC	-	50 $\pi^- p \rightarrow K_S^0 K^- p$
106	± 4	4000		CHABAUD	80	SPEC	-	17 $\pi^- A \rightarrow K_S^0 K^- A$
126	± 11	11000		CHABAUD	78	SPEC	-	9.8 $\pi^- p \rightarrow K^- K_S^0 p$
101	± 8	4730		CHABAUD	78	SPEC	-	18.8 $\pi^- p \rightarrow K^- K_S^0 p$
113	± 4		13,15	MARTIN	78D	SPEC	-	10 $\pi^- p \rightarrow K_S^0 K^- p$
105	± 8	2724	15	MARGULIE	76	SPEC	-	23 $\pi^- p \rightarrow K^- K_S^0 p$
113	± 19	730		FOLEY	72	CNTR	-	20.3 $\pi^- p \rightarrow K^- K_S^0 p$
123	± 13	1500	15	GRAYER	71	ASPK	-	17.2 $\pi^- p \rightarrow K^- K_S^0 p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

120	± 15	870	16	SCHEGELSKY	06A	RVUE	0	$\gamma\gamma \rightarrow K_S^0 K_S^0$
121	± 51	1000	13,14	CLELAND	82B	SPEC	+	30 $\pi^+ p \rightarrow K_S^0 K^+ p$
110	± 18	350		HYAMS	78	ASPK	+	12.7 $\pi^+ p \rightarrow K^+ K_S^0 p$

13 From a fit to $J^P = 2^+$ partial wave.

14 Number of events evaluated by us.

15 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

16 From analysis of L3 data at 91 and 183–209 GeV.

$\eta\pi$ MODE

VALUE (MeV) EVTS DOCUMENT ID TECN CHG COMMENT

The data in this block is included in the average printed for a previous datablock.

111.1± 2.4 OUR AVERAGE

115	± 20			BARBERIS	00H			$450 pp \rightarrow p_f \eta \pi^0 p_s$
112	± 14			BARBERIS	00H			$450 pp \rightarrow \Delta_f^{++} \eta \pi^- p_s$
112	± 3	±2	17	AMSLER	94D	CBAR		0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$
103	± 6	±3		BELADIDZE	93	VES		37 $\pi^- N \rightarrow \eta \pi^- N$
112.2± 5.7	2561			DELFOSSE	81	SPEC	+	$\pi^\pm p \rightarrow p \pi^\pm \eta$
116.6± 7.7	1653			DELFOSSE	81	SPEC	-	$\pi^\pm p \rightarrow p \pi^\pm \eta$
108	± 9	1000		KEY	73	OSPK	-	6 $\pi^- p \rightarrow p \pi^- \eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

110	± 4			ANISOVICH	09	RVUE		$\bar{p}p, \pi N$
127	± 2	±2	18	THOMPSON	97	MPS		18 $\pi^- p \rightarrow \eta \pi^- p$
118	± 10			ARMSTRONG	93C	E760	0	$\bar{p}p \rightarrow \pi^0 \eta \eta \rightarrow 6\gamma$
104	± 9	6200	19	CONFORTO	73	OSPK	-	6 $\pi^- p \rightarrow p MM^-$

17 The systematic error of 2 MeV corresponds to the spread of solutions.

18 Resolution is not unfolded.

19 Missing mass with enriched MMS = $\eta\pi^-$, $\eta = 2\gamma$.

$\eta'\pi$ MODE

VALUE (MeV) DOCUMENT ID TECN COMMENT

119±25 OUR AVERAGE

140±35±20				IVANOV	01	B852	18	$\pi^- p \rightarrow \eta' \pi^- p$
106±32				BELADIDZE	93	VES	37	$\pi^- N \rightarrow \eta' \pi^- N$

NODE=M012W1;LINKAGE=P

NODE=M012W1;LINKAGE=S

NODE=M012W1;LINKAGE=SC

NODE=M012W0

NODE=M012W0

→ UNCHECKED ←

NODE=M012W2

NODE=M012W2

OCCUR=2

OCCUR=3

OCCUR=2

NODE=M012W2;LINKAGE=P

NODE=M012W2;LINKAGE=W

NODE=M012W2;LINKAGE=S

NODE=M012W2;LINKAGE=SC

NODE=M012W3

NODE=M012W3

OCCUR=2

NODE=M012W3;LINKAGE=DD

NODE=M012W3;LINKAGE=A

NODE=M012W3;LINKAGE=M

NODE=M012W4

NODE=M012W4

a₂(1320) DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 3π	$(70.1 \pm 2.7) \%$	S=1.2
Γ_2 $\rho(770)\pi$		DESIG=1
Γ_3 $f_2(1270)\pi$		DESIG=11
Γ_4 $\rho(1450)\pi$		DESIG=12
Γ_5 $\eta\pi$	$(14.5 \pm 1.2) \%$	DESIG=13
Γ_6 $\omega\pi\pi$	$(10.6 \pm 3.2) \%$	DESIG=3
Γ_7 $K\bar{K}$	$(4.9 \pm 0.8) \%$	DESIG=4
Γ_8 $\eta'(958)\pi$	$(5.3 \pm 0.9) \times 10^{-3}$	DESIG=2
Γ_9 $\pi^\pm\gamma$	$(2.68 \pm 0.31) \times 10^{-3}$	DESIG=8
Γ_{10} $\gamma\gamma$	$(9.4 \pm 0.7) \times 10^{-6}$	DESIG=7
Γ_{11} e^+e^-	$< 5 \times 10^{-9}$	DESIG=9
		CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 5 branching ratios uses 18 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 = 9.3$ for 15 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|ccc} & & & \\ & 10 & & \\ \hline x_5 & -89 & -46 & \\ x_6 & -1 & -2 & -24 \\ \hline & x_1 & x_5 & x_6 \end{array}$$

a₂(1320) PARTIAL WIDTHS **$\Gamma(\eta\pi)$**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_5
• • • We do not use the following data for averages, fits, limits, etc. • • •						
18.5 ± 3.0	870	²⁰ SCHEGELSKY 06A RVUE 0			$\gamma\gamma \rightarrow K_S^0 K_S^0$	

20 From analysis of L3 data at 91 and 183–209 GeV, using $\Gamma(a_2(1320) \rightarrow \gamma\gamma) = 0.91$ keV and SU(3) relations.

 $\Gamma(K\bar{K})$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_7
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$7.0^{+2.0}_{-1.5}$	870	²¹ SCHEGELSKY 06A RVUE 0			$\gamma\gamma \rightarrow K_S^0 K_S^0$	

21 From analysis of L3 data at 91 and 183–209 GeV, using $\Gamma(a_2(1320) \rightarrow \gamma\gamma) = 0.91$ keV and SU(3) relations.

 $\Gamma(\pi^\pm\gamma)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_9
287 ± 30 OUR AVERAGE						
$284 \pm 25 \pm 25$	7100	MOLCHANOV 01 SELX			$600 \pi^- A \rightarrow \pi^+ \pi^- \pi^- A$	
295 ± 60		CIHANGIR 82 SPEC +			$200 \pi^+ A$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
461 ± 110	²² MAY	77 SPEC ±			$9.7 \gamma A$	

22 Assuming one-pion exchange.

NODE=M012215;NODE=M012

DESIG=1

DESIG=11

DESIG=12

DESIG=13

DESIG=3

DESIG=4

DESIG=2

DESIG=8

DESIG=7

DESIG=9

DESIG=10

NODE=M012220

NODE=M012W6

NODE=M012W6

NODE=M012W6;LINKAGE=SC

NODE=M012W5

NODE=M012W5

NODE=M012W5;LINKAGE=SC

NODE=M012W7

NODE=M012W7

NODE=M012W;LINKAGE=M2

$\Gamma(\gamma\gamma)$

<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_{10}
1.00±0.06 OUR AVERAGE						
0.98±0.05±0.09		ACCIARRI	97T	L3	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$	NODE=M012W9
0.96±0.03±0.13		ALBRECHT	97B	ARG	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$	NODE=M012W9
1.26±0.26±0.18	36	BARU	90	MD1	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$	
1.00±0.07±0.15	415	BEHREND	90C	CELL 0	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$	
1.03±0.13±0.21		BUTLER	90	MRK2	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$	
1.01±0.14±0.22	85	OEST	90	JADE	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0 \eta$	
0.90±0.27±0.15	56	23 ALTHOFF	86	TASS 0	$e^+ e^- \rightarrow e^+ e^- 3\pi$	
1.14±0.20±0.26		24 ANTREASYAN	86	CBAL 0	$e^+ e^- \rightarrow e^+ e^- \pi^0 \eta$	
1.06±0.18±0.19		BERGER	84C	PLUT 0	$e^+ e^- \rightarrow e^+ e^- 3\pi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.81±0.19 ^{+0.42} _{-0.11}	35	23 BEHREND	83B	CELL 0	$e^+ e^- \rightarrow e^+ e^- 3\pi$	
0.77±0.18±0.27	22	24 EDWARDS	82F	CBAL 0	$e^+ e^- \rightarrow e^+ e^- \pi^0 \eta$	

23 From $\rho\pi$ decay mode.24 From $\eta\pi^0$ decay mode. $\Gamma(e^+ e^-)$

<u>VALUE (eV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{11}
< 0.56	90	ACHASOV	00K	SND	$e^+ e^- \rightarrow \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<25	90	VOROBYEV	88	ND	$e^+ e^- \rightarrow \pi^0 \eta$

 $a_2(1320) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_1 \Gamma_{10}/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.65±0.02±0.02	18k	25 SCHEGELSKY	06	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$
25 From analysis of L3 data at 183–209 GeV.					

 $\Gamma(\eta\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_5 \Gamma_{10}/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.145 ^{+0.097} _{-0.034}	26 UEHARA	09A	BELL	$e^+ e^- \rightarrow e^+ e^- \eta\pi^0$
26 From the D_2 -wave. The fraction of the D_0 -wave is $3.4^{+2.3\%}_{-1.1\%}$.				

 $\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_7 \Gamma_{10}/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.126±0.007±0.028	27 ALBRECHT	90G	ARG	$e^+ e^- \rightarrow e^+ e^- K^+ K^-$
27 Using an incoherent background.				
0.081±0.006±0.027	28 ALBRECHT	90G	ARG	$e^+ e^- \rightarrow e^+ e^- K^+ K^-$
28 Using a coherent background.				

 $a_2(1320) \text{ BRANCHING RATIOS}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	$(\Gamma_3 + \Gamma_4)/\Gamma_2$
<0.12	90	ABRAMOVI...	70B	HBC	—	$3.93 \pi^- p$

NODE=M012W9

NODE=M012W9

NODE=M012W;LINKAGE=F
NODE=M012W;LINKAGE=GNODE=M012W10
NODE=M012W10

NODE=M012223

NODE=M012G2
NODE=M012G2

NODE=M012G2;LINKAGE=SC

NODE=M012G01
NODE=M012G01

NODE=M012G01;LINKAGE=UE

NODE=M012G1
NODE=M012G1

OCCUR=2

NODE=M012G1;LINKAGE=A
NODE=M012G1;LINKAGE=B

NODE=M012225

NODE=M012R9
NODE=M012R9

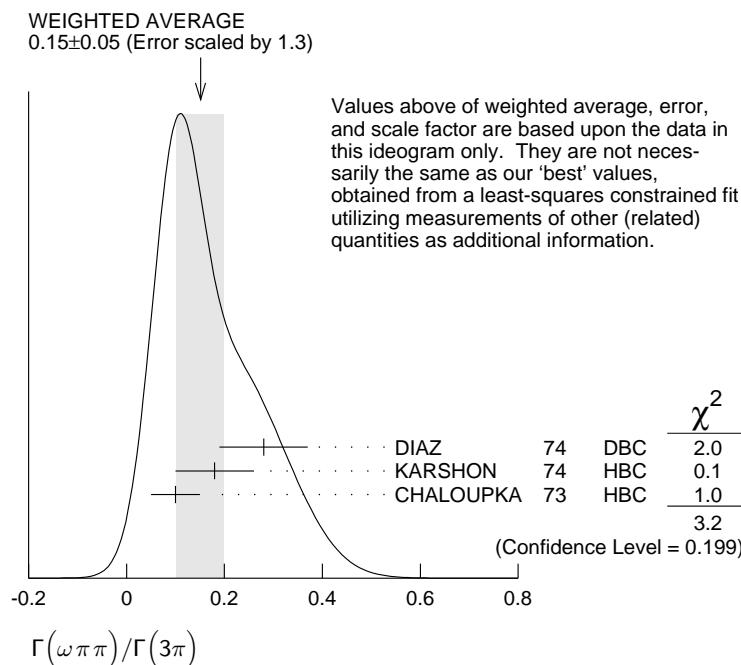
$\Gamma(\eta\pi)/\Gamma(3\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_5/Γ_1
0.207±0.018 OUR FIT						NODE=M012R3
0.213±0.020 OUR AVERAGE						NODE=M012R3
0.18 ±0.05		FORINO	76	HBC	11 $\pi^- p$	
0.22 ±0.05	52	ANTIPOV	73	CNTR	— 40 $\pi^- p$	
0.211±0.044	149	CHALOUPKA	73	HBC	— 3.9 $\pi^- p$	
0.246±0.042	167	ALSTON-...	71	HBC	+ 7.0 $\pi^+ p$	
0.25 ±0.09	15	BOECKMANN	70	HBC	+ 5.0 $\pi^+ p$	
0.23 ±0.08	22	ASCOLI	68	HBC	— 5 $\pi^- p$	
0.12 ±0.08		CHUNG	68	HBC	— 3.2 $\pi^- p$	
0.22 ±0.09		CONTE	67	HBC	— 11.0 $\pi^- p$	

 $\Gamma(\omega\pi\pi)/\Gamma(3\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_6/Γ_1
0.15±0.05 OUR FIT					Error includes scale factor of 1.3.	NODE=M012R12
0.15±0.05 OUR AVERAGE					Error includes scale factor of 1.3. See the ideogram below.	NODE=M012R12
0.28±0.09	60	DIAZ	74	DBC	0 6 $\pi^+ n$	
0.18±0.08	29	KARSHON	74	HBC	Avg. of above two	OCCUR=3
0.10±0.05	279	CHALOUPKA	73	HBC	— 3.9 $\pi^- p$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.29±0.08	140	29 KARSHON	74	HBC	0 4.9 $\pi^+ p$	
0.10±0.04	60	29 KARSHON	74	HBC	+ 4.9 $\pi^+ p$	OCCUR=2
0.19±0.08		DEFIOIX	73	HBC	0 0.7 $\bar{p}p$	

29 KARSHON 74 suggest an additional $I = 0$ state strongly coupled to $\omega\pi\pi$ which could explain discrepancies in branching ratios and masses. We use a central value and a systematic spread.

 $\Gamma(K\bar{K})/\Gamma(3\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_7/Γ_1
0.070±0.012 OUR FIT						NODE=M012R1
0.078±0.017		CHABAUD	78	RVUE		NODE=M012R1
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.011±0.003	30	BERTIN	98B	OBLX	0.0 $\bar{p}p \rightarrow K^\pm K_S \pi^\mp$	
0.056±0.014	50	31 CHALOUPKA	73	HBC	— 3.9 $\pi^- p$	
0.097±0.018	113	31 ALSTON-...	71	HBC	+ 7.0 $\pi^+ p$	
0.06 ±0.03		31 ABRAMOVIC...	70B	HBC	— 3.93 $\pi^- p$	
0.054±0.022		31 CHUNG	68	HBC	— 3.2 $\pi^- p$	

30 Using 4π data from BERTIN 97D.

31 Included in CHABAUD 78 review.

NODE=M012R1;LINKAGE=BE
NODE=M012R1;LINKAGE=C

$\Gamma(K\bar{K})/\Gamma(\eta\pi)$						Γ_7/Γ_5
VALUE	DOCUMENT ID	TECN	COMMENT			
<p>• • • We do not use the following data for averages, fits, limits, etc. • • •</p>						
0.08±0.02	32 BERTIN	98B OBLX	0.0 $\bar{p}p \rightarrow K^\pm K_s \pi^\mp$			NODE=M012R14 NODE=M012R14
<p>32 Using $\eta\pi\pi$ data from AMSLER 94D.</p>						
$\Gamma(\eta\pi)/[\Gamma(3\pi) + \Gamma(\eta\pi) + \Gamma(K\bar{K})]$						$\Gamma_5/(\Gamma_1+\Gamma_5+\Gamma_7)$
VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
<p>0.162±0.012 OUR FIT</p>						
<p>0.140±0.028 OUR AVERAGE</p>						
0.13 ± 0.04		ESPIGAT	72 HBC	±	0.0 $\bar{p}p$	NODE=M012R2 NODE=M012R2
0.15 ± 0.04	34	BARNHAM	71 HBC	+	3.7 $\pi^+ p$	
$\Gamma(K\bar{K})/[\Gamma(3\pi) + \Gamma(\eta\pi) + \Gamma(K\bar{K})]$						$\Gamma_7/(\Gamma_1+\Gamma_5+\Gamma_7)$
VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
<p>0.054±0.009 OUR FIT</p>						
<p>0.048±0.012 OUR AVERAGE</p>						
0.05 ± 0.02		TOET	73 HBC	+	5 $\pi^+ p$	NODE=M012R8 NODE=M012R8
0.09 ± 0.04		TOET	73 HBC	0	5 $\pi^+ p$	
0.03 ± 0.02	8	DAMERI	72 HBC	-	11 $\pi^- p$	OCCUR=2
0.06 ± 0.03	17	BARNHAM	71 HBC	+	3.7 $\pi^+ p$	
<p>• • • We do not use the following data for averages, fits, limits, etc. • • •</p>						
0.020±0.004	33	ESPIGAT	72 HBC	±	0.0 $\bar{p}p$	
<p>33 Not averaged because of discrepancy between masses from $K\bar{K}$ and $\rho\pi$ modes.</p>						
$\Gamma(\eta'(958)\pi)/\Gamma_{\text{total}}$						Γ_8/Γ
VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT	
<p>• • • We do not use the following data for averages, fits, limits, etc. • • •</p>						
<0.006	95	ALDE	92B GAM2		38,100 $\pi^- p \rightarrow \eta' \pi^0 n$	NODE=M012R4 NODE=M012R4
<0.02	97	BARNHAM	71 HBC	+	3.7 $\pi^+ p$	
0.004±0.004		BOESEBECK	68 HBC	+	8 $\pi^+ p$	
$\Gamma(\eta'(958)\pi)/\Gamma(3\pi)$						Γ_8/Γ_1
VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT	
<p>• • • We do not use the following data for averages, fits, limits, etc. • • •</p>						
<0.011	90	EISENSTEIN	73 HBC	-	5 $\pi^- p$	NODE=M012R5 NODE=M012R5
<0.04		ALSTON-...	71 HBC	+	7.0 $\pi^+ p$	
0.04 +0.03 -0.04		BOECKMANN	70 HBC	0	5.0 $\pi^+ p$	
$\Gamma(\eta'(958)\pi)/\Gamma(\eta\pi)$						Γ_8/Γ_5
VALUE	DOCUMENT ID	TECN	COMMENT			
<p>0.037±0.006 OUR AVERAGE</p>						
0.032±0.009		ABELE	97C CBAR	0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta'$		NODE=M012R13 NODE=M012R13
0.047±0.010±0.004	34	BELADIDZE	93 VES	37 $\pi^- N \rightarrow a_2^- N$		
0.034±0.008±0.005		BELADIDZE	92 VES	36 $\pi^- C \rightarrow a_2^- C$		
<p>34 Using $B(\eta' \rightarrow \pi^+ \pi^- \eta) = 0.441$, $B(\eta \rightarrow \gamma\gamma) = 0.389$ and $B(\eta \rightarrow \pi^+ \pi^- \pi^0) = 0.236$.</p>						
$\Gamma(\pi^\pm\gamma)/\Gamma_{\text{total}}$						Γ_9/Γ
VALUE	DOCUMENT ID	TECN	COMMENT			
<p>• • • We do not use the following data for averages, fits, limits, etc. • • •</p>						
0.005 +0.005 -0.003	35	EISENBERG	72 HBC	4.3,5.25,7.5 γp		NODE=M012R11 NODE=M012R11
<p>35 Pion-exchange model used in this estimation.</p>						
$\Gamma(e^+e^-)/\Gamma_{\text{total}}$						Γ_{11}/Γ
VALUE (units 10^{-9})	CL%	DOCUMENT ID	TECN	COMMENT		
<p>• • • We do not use the following data for averages, fits, limits, etc. • • •</p>						
<6	90	ACHASOV	00K SND	$e^+ e^- \rightarrow \pi^0 \pi^0$		NODE=M012R15 NODE=M012R15

a₂(1320) REFERENCES

a ₂ (1320) REFERENCES				NODE=M012
ALEKSEEV	10	PRL 104 241803	M.G. Alekseev <i>et al.</i>	REFID=53356
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	REFID=52719
UEHARA	09A	PR D80 032001	S. Uehara <i>et al.</i>	REFID=53002
SCHEGELSKY	06	EPJ A27 199	V.A. Schegelsky <i>et al.</i>	REFID=51186
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>	REFID=51185
CHUNG	02	PR D65 072001	S.U. Chung <i>et al.</i>	REFID=48837
IVANOV	01	PRL 86 3977	E.I. Ivanov <i>et al.</i>	REFID=48317
MOLCHANOV	01	PL B521 171	V.V. Molchanov <i>et al.</i>	REFID=48559
ACHASOV	00K	PL B492 8	M.N. Achasov <i>et al.</i>	REFID=47933
BARBERIS	00H	PL B488 225	D. Barberis <i>et al.</i>	REFID=47964
BARBERIS	98B	PL B422 399	D. Barberis <i>et al.</i>	REFID=46345
BERTIN	98B	PL B434 180	A. Bertin <i>et al.</i>	REFID=46351
ABELE	97C	PL B404 179	A. Abele <i>et al.</i>	REFID=45531
ACCIARRI	97T	PL B413 147	M. Acciari <i>et al.</i>	REFID=45761
ALBRECHT	97B	ZPHY C74 469	H. Albrecht <i>et al.</i>	REFID=45418
THOMPSON	97	PRL 79 1630	D.R. Thompson <i>et al.</i>	REFID=45584
AMELIN	96	ZPHY C70 71	D.V. Amelin <i>et al.</i>	REFID=44649
AMSLER	94D	PL B333 277	C. Amsler <i>et al.</i>	REFID=44093
AOYAGI	93	PL B314 246	H. Aoyagi <i>et al.</i>	REFID=43599
ARMSTRONG	93C	PL B307 394	T.A. Armstrong <i>et al.</i>	REFID=43587
BELADIDZE	93	PL B313 276	G.M. Beladidze <i>et al.</i>	REFID=43598
CONDO	93	PR D48 3045	G.T. Condo <i>et al.</i>	REFID=43600
ALDE	92B	ZPHY C54 549	D.M. Alde <i>et al.</i>	REFID=41852
BELADIDZE	92	ZPHY C54 235	G.M. Beladidze <i>et al.</i>	REFID=42171
ALBRECHT	90G	ZPHY C48 183	H. Albrecht <i>et al.</i>	REFID=41374
ARMSTRONG	90	ZPHY C48 213	T.A. Armstrong, M. Benayoun, W. Beusch (WA76 Coll.)	REFID=41375
BARU	90	ZPHY C48 581	S.E. Baru <i>et al.</i>	REFID=41366
BEHREND	90C	ZPHY C46 583	H.J. Behrend <i>et al.</i>	REFID=41356
BUTLER	90	PR D42 1368	F. Butler <i>et al.</i>	REFID=41363
OEST	90	ZPHY C47 343	T. Oest <i>et al.</i>	REFID=41358
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	REFID=41004
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	REFID=41023
Translated from YAF 48 436.				
ALTHOFF	86	ZPHY C31 537	M. Althoff <i>et al.</i>	REFID=21287
ANTREASYAN	86	PR D33 1847	D. Antreasyan <i>et al.</i>	REFID=20469
BERGER	84C	PL 149B 427	C. Berger <i>et al.</i>	REFID=21286
BEHREND	83B	PL 125B 518 (erratum)	H.J. Behrend <i>et al.</i>	REFID=20302
CIHANGIR	82	PL 117B 123	S. Cihangir <i>et al.</i>	REFID=21280
CLELAND	82B	NP B208 228	W.E. Cleland <i>et al.</i>	REFID=21281
EDWARDS	82F	PL 110B 82	C. Edwards <i>et al.</i>	REFID=20747
DELFOSSÉ	81	NP B183 349	A. Delfosse <i>et al.</i>	REFID=21277
EVANGELIS...	81	NP B178 197	C. Evangelista <i>et al.</i>	REFID=20462
CHABAUD	80	NP B175 189	V. Chabaud <i>et al.</i>	REFID=21274
DAUM	80C	PL 89B 276	C. Daum <i>et al.</i>	REFID=21275
BALTAJ	78B	PR D17 62	C. Baltay <i>et al.</i>	REFID=21265
CHABAUD	78	NP B145 349	V. Chabaud <i>et al.</i>	REFID=21267
FERRERSORIA	78	PL 74B 287	A. Ferrer Soria <i>et al.</i>	REFID=21270
HYAMS	78	NP B146 303	B.D. Hyams <i>et al.</i>	REFID=21271
MARTIN	78D	PL 74B 417	A.D. Martin <i>et al.</i>	REFID=21272
MAY	77	PR D16 1983	E.N. May <i>et al.</i>	REFID=20450
FORINO	76	NC 35A 465	A. Forino <i>et al.</i>	REFID=21259
MARGULIE	76	PR D14 667	M. Margulies <i>et al.</i>	REFID=21261
EMMS	75	PL 58B 117	M.J. Emms <i>et al.</i>	REFID=21254
WAGNER	75	PL 58B 201	F. Wagner, M. Tabak, D.M. Chew	REFID=20843
DAIAZ	74	PRL 32 260	J. Diaz <i>et al.</i>	REFID=21248
KARSHON	74	PRL 32 852	U. Karshon <i>et al.</i>	REFID=21249
ANTIPOV	73	NP B63 175	Y.M. Antipov <i>et al.</i>	REFID=21238
ANTIPOV	73C	NP B63 153	Y.M. Antipov <i>et al.</i>	REFID=20817
CHALOUPKA	73	PL 44B 211	V. Chaloupka <i>et al.</i>	REFID=21242
CONFORTO	73	PL 45B 154	G. Conforto <i>et al.</i>	REFID=21243
DEFFOIX	73	PL 43B 141	C. Defoix <i>et al.</i>	REFID=21244
EISENSTEIN	73	PR D7 278	L. Eisenstein <i>et al.</i>	REFID=21245
KEY	73	PRL 30 503	A.W. Key <i>et al.</i>	REFID=21246
TOET	73	NP B63 248	D.Z. Toet <i>et al.</i>	REFID=20714
DAMERI	72	NC 9A 1	M. Dameri <i>et al.</i>	REFID=20338
EISENBERG	72	PR D5 15	Y. Eisenberg <i>et al.</i>	REFID=20098
ESPIGAT	72	NP B36 93	P. Espigat <i>et al.</i>	REFID=21232
FOLEY	72	PR D6 747	K.J. Foley <i>et al.</i>	REFID=21233
ALSTON---	71	PL 34B 156	M. Alston-Garnjost <i>et al.</i>	REFID=21214
BARNHAM	71	PRL 26 1494	K.W.J. Barnham <i>et al.</i>	REFID=21215
BINNIE	71	PL 36B 257	D.M. Binnie <i>et al.</i>	REFID=21217
BOWEN	71	PRL 26 1663	D.R. Bowen <i>et al.</i>	REFID=21219
GRAYER	71	PL 34B 333	G. Grayer <i>et al.</i>	REFID=21223
ABRAMOVIC...	70B	NP B23 466	M. Abramovich <i>et al.</i>	REFID=21195
ALSTON---	70	PL 33B 607	M. Alston-Garnjost <i>et al.</i>	REFID=21196
BOECKMANN	70	NP B16 221	K. Boeckmann <i>et al.</i>	REFID=21202
ASCOLI	68	PRL 20 1321	G. Ascoli <i>et al.</i>	REFID=21171
BOESEBECK	68	NP B4 501	K. Boesebeck <i>et al.</i>	REFID=20585
CHUNG	68	PR 165 1491	S.U. Chung <i>et al.</i>	REFID=20059
CONTE	67	NC 51A 175	F. Conte <i>et al.</i>	REFID=21166

$f_0(1370)$ $I^G(J^{PC}) = 0^+(0^{++})$

See also the mini-reviews on scalar mesons under $f_0(500)$ (see the index for the page number) and on non- $q\bar{q}$ candidates in PDG 06, Journal of Physics, G **33** 1 (2006).

$f_0(1370)$ T-MATRIX POLE POSITION

Note that $\Gamma \approx 2 \operatorname{Im}(\sqrt{s_{\text{pole}}})$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
(1200–1500)–i(150–250) OUR ESTIMATE			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
(1290 ± 50)– i (170 ⁺²⁰ _{−40})	¹ ANISOVICH	09 RVUE	0.0 $\bar{p}p, \pi N$
(1373 ± 15)– i (137 ± 10)	² BARGIOTTI	03 OBLX	$\bar{p}p$
(1302 ± 17)– i (166 ± 18)	³ BARBERIS	00C	450 $p p \rightarrow p_f 4\pi p_s$
(1312 ± 25 ± 10)– i (109 ± 22 ± 15)	BARBERIS	99D OMEG	450 $p p \rightarrow K^+ K^-, \pi^+ \pi^-$
(1406 ± 19)– i (80 ± 6)	⁴ KAMINSKI	99 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$
(1300 ± 20)– i (120 ± 20)	ANISOVICH	98B RVUE	Compilation
(1290 ± 15)– i (145 ± 15)	BARBERIS	97B OMEG	450 $p p \rightarrow \bar{p}p 2(\pi^+ \pi^-)$
(1548 ± 40)– i (560 ± 40)	BERTIN	97C OBLX	0.0 $\bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
(1380 ± 40)– i (180 ± 25)	ABELE	96B CBAR	0.0 $\bar{p}p \rightarrow \pi^0 K_L^0 K_L^0$
(1300 ± 15)– i (115 ± 8)	BUGG	96 RVUE	
(1330 ± 50)– i (150 ± 40)	⁵ AMSLER	95B CBAR	$\bar{p}p \rightarrow 3\pi^0$
(1360 ± 35)– i (150–300)	⁵ AMSLER	95C CBAR	$\bar{p}p \rightarrow \pi^0 \eta\eta$
(1390 ± 30)– i (190 ± 40)	⁶ AMSLER	95D CBAR	$\bar{p}p \rightarrow 3\pi^0, \pi^0 \eta\eta, \pi^0 \pi^0 \eta$
1346 – i 249	^{7,8} JANSEN	95 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
1214 – i 168	^{8,9} TORNQVIST	95 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
1364 – i 139	AMSLER	94D CBAR	$\bar{p}p \rightarrow \pi^0 \pi^0 \eta$
(1365 ⁺²⁰ _{−55})– i (134 ± 35)	ANISOVICH	94 CBAR	$\bar{p}p \rightarrow 3\pi^0, \pi^0 \eta\eta$
(1340 ± 40)– i (127 ⁺³⁰ _{−20})	¹⁰ BUGG	94 RVUE	$\bar{p}p \rightarrow 3\pi^0, \eta\eta\pi^0, \eta\pi^0 \pi^0$
(1430 ± 5)– i (73 ± 13)	¹¹ KAMINSKI	94 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$
1420 – i 220	¹² AU	87 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}$

1 Another pole is found at $(1510 \pm 130) - i(800 \pm 100)$ MeV.

2 Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^0 \pi^\mp$.

3 Average between $\pi^+ \pi^- 2\pi^0$ and $2(\pi^+ \pi^-)$.

4 T-matrix pole on sheet ——.

5 Supersedes ANISOVICH 94.

6 Coupled-channel analysis of $\bar{p}p \rightarrow 3\pi^0, \pi^0 \eta\eta$, and $\pi^0 \pi^0 \eta$ on sheet IV. Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.

7 Analysis of data from FALVARD 88.

8 The pole is on Sheet III. Demonstrates explicitly that $f_0(500)$ and $f_0(1370)$ are two different poles.

9 Uses data from BEIER 72B, OCHS 73, HYAMS 73, GRAYER 74, ROSSELET 77, CASON 83, ASTON 88, and ARMSTRONG 91B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.

10 Reanalysis of ANISOVICH 94 data.

11 T-matrix pole on sheet III.

12 Analysis of data from OCHS 73, GRAYER 74, BECKER 79, and CASON 83.

$f_0(1370)$ BREIT-WIGNER MASS OR K-MATRIX POLE PARAMETER

VALUE (MeV)	DOCUMENT ID
1200 to 1500 OUR ESTIMATE	

NODE=M147

NODE=M147

NODE=M147PP

NODE=M147PP

NODE=M147PP

→ UNCHECKED ←

OCCUR=2

OCCUR=2

OCCUR=2

NODE=M147PP;LINKAGE=AO

NODE=M147PP;LINKAGE=BG

NODE=M147PP;LINKAGE=PC

NODE=M147PP;LINKAGE=TK

NODE=M147PP;LINKAGE=K

NODE=M147PP;LINKAGE=A

NODE=M147PP;LINKAGE=C

NODE=M147PP;LINKAGE=DD

NODE=M147PP;LINKAGE=BB

NODE=M147PP;LINKAGE=C1

NODE=M147PP;LINKAGE=KM

NODE=M147PP;LINKAGE=H

NODE=M147205

NODE=M147M

→ UNCHECKED ←

$\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1400±40	13	AUBERT	09L	BABR $B^\pm \rightarrow \pi^\pm \pi^\pm \pi^\mp$
1470 $^+ 6$ $_7$ $^{+ 72}$ $_{-255}$	14	UEHARA	08A	BELL $10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
1259±55	2.6k	BONVICINI	07	CLEO $D^+ \rightarrow \pi^- \pi^+ \pi^+$
1309± 1± 15	15	BUGG	07A	RVUE $0.0 p\bar{p} \rightarrow 3\pi^0$
1449±13	4.3k	16 GARMASH	06	BELL $B^+ \rightarrow K^+ \pi^+ \pi^-$
1350±50		ABLIKIM	05	BES2 $J/\psi \rightarrow \phi \pi^+ \pi^-$
1265±30 $^{+ 20}$ $_{-35}$		ABLIKIM	05Q	BES2 $\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$
1434±18± 9	848	AITALA	01A	E791 $D_s^+ \rightarrow \pi^- \pi^+ \pi^+$
1308±10		BARBERIS	99B	OMEG $450 pp \rightarrow p_s p_f \pi^+ \pi^-$
1315±50		BELLAZZINI	99	GAM4 $450 pp \rightarrow p p \pi^0 \pi^0$
1315±30		ALDE	98	GAM4 $100 \pi^- p \rightarrow \pi^0 \pi^0 n$
1280±55		BERTIN	98	OBLX $0.05-0.405 \bar{n} p \rightarrow \pi^+ \pi^+ \pi^-$
1186	17,18	TORNQVIST	95	RVUE $\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$
1472±12		ARMSTRONG	91	OMEG $300 pp \rightarrow p p \pi\pi, p p K\bar{K}$
1275±20		BREAKSTONE	90	SFM $62 pp \rightarrow p p \pi^+ \pi^-$
1420±20		AKESSON	86	SPEC $63 pp \rightarrow p p \pi^+ \pi^-$
1256		FROGGATT	77	RVUE $\pi^+ \pi^-$ channel
13 Breit-Wigner mass.				
14 Breit-Wigner mass. May also be the $f_0(1500)$.				
15 Reanalysis of ABELE 96C data.				
16 Also observed by GARMASH 07 in $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ decays. Supersedes GARMASH 05.				
17 Uses data from BEIER 72B, OCHS 73, HYAMS 73, GRAYER 74, ROSSELET 77, CASON 83, ASTON 88, and ARMSTRONG 91B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.				
18 Also observed by ASNER 00 in $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ decays				

NODE=M147M1

NODE=M147M1

 $K\bar{K}$ MODE

VALUE (MeV)		DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1440± 6		VLADIMIRSK...	06	SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$
1391±10		TIKHOMIROV	03	SPEC $40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
1440±50		BOLONKIN	88	SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$
1463± 9		ETKIN	82B	MPS $23 \pi^- p \rightarrow n 2 K_S^0$
1425±15		WICKLUND	80	SPEC $6 \pi N \rightarrow K^+ K^- N$
~1300		POLYCHRO...	79	STRC $7 \pi^- p \rightarrow n 2 K_S^0$

NODE=M147M1;LINKAGE=BW

NODE=M147M1;LINKAGE=UE

NODE=M147M1;LINKAGE=BU

NODE=M147M1;LINKAGE=GR

NODE=M147M1;LINKAGE=BB

 4π MODE 2($\pi\pi$) $S+\rho\rho$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1395±40		ABELE	01	CBAR $0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$
1374±38		AMSLER	94	CBAR $0.0 \bar{p}p \rightarrow \pi^+ \pi^- 3\pi^0$
1345±12		ADAMO	93	OBLX $\bar{n}p \rightarrow 3\pi^+ 2\pi^-$
1386±30		GASPERO	93	DBC $0.0 \bar{p}n \rightarrow 2\pi^+ 3\pi^-$
~1410	5751	19 BETTINI	66	DBC $0.0 \bar{p}n \rightarrow 2\pi^+ 3\pi^-$
19 $\rho\rho$ dominant.				

NODE=M147M3

NODE=M147M3

 $\eta\eta$ MODE

VALUE (MeV)		DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1262 $^{+51}_{-78}$ $^{+82}_{-103}$	20	UEHARA	10A	BELL $10.6 e^+ e^- \rightarrow e^+ e^- \eta\eta$
1430		AMSLER	92	CBAR $0.0 \bar{p}p \rightarrow \pi^0 \eta\eta$
1220±40		ALDE	86D	GAM4 $100 \pi^- p \rightarrow n 2\eta$
20 Breit-Wigner mass. May also be the $f_0(1500)$.				

NODE=M147M3;LINKAGE=BE

NODE=M147M4

NODE=M147M4

NODE=M147M4;LINKAGE=UE

COUPLED CHANNEL MODE

VALUE (MeV)	DOCUMENT ID	TECN
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1306±20 21 ANISOVICH 03 RVUE

21 K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K\bar{K}n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.

NODE=M147M5

NODE=M147M5

NODE=M147M;LINKAGE=KM

 $f_0(1370)$ BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID
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200 to 500 OUR ESTIMATE

 $\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

300± 80 22 AUBERT 09L BABR $B^\pm \rightarrow \pi^\pm \pi^\pm \pi^\mp$

90₋⁺ 2₋⁺ 50
1 - 22

23 UEHARA 08A BELL $10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$

298± 21 2.6k BONVICINI 07 CLEO $D^+ \rightarrow \pi^- \pi^+ \pi^+$

126± 25 4286 GARMASH 06 BELL $B^+ \rightarrow K^+ \pi^+ \pi^-$

265± 40 ABLIKIM 05 BES2 $J/\psi \rightarrow \phi \pi^+ \pi^-$

350±100₋⁺¹⁰⁵ 60 ABLIKIM 05Q BES2 $\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$

173± 32± 6 848 AITALA 01A E791 $D_s^+ \rightarrow \pi^- \pi^+ \pi^+$

222± 20 BARBERIS 99B OMEG 450 $p p \rightarrow p_S p_F \pi^+ \pi^-$

255± 60 BELLAZZINI 99 GAM4 450 $p p \rightarrow p p \pi^0 \pi^0$

190± 50 ALDE 98 GAM4 100 $\pi^- p \rightarrow \pi^0 \pi^0 n$

323± 13 BERTIN 98 OBLX 0.05–0.405 $\bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$

350 25,26 TORNQVIST 95 RVUE $\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi, \eta\pi$

195± 33 ARMSTRONG 91 OMEG 300 $p p \rightarrow p p \pi\pi, p p K\bar{K}$

285± 60 BREAKSTONE 90 SFM 62 $p p \rightarrow p p \pi^+ \pi^-$

460± 50 AKESSON 86 SPEC 63 $p p \rightarrow p p \pi^+ \pi^-$

~ 400 27 FROGGATT 77 RVUE $\pi^+ \pi^-$ channel

22 The systematic errors are not reported.

23 Breit-Wigner width. May also be the $f_0(1500)$.

24 Also observed by GARMASH 07 in $B^0 \rightarrow K_S^0 \pi^+ \pi^-$ decays. Supersedes GARMASH 05.

25 Uses data from BEIER 72B, OCHS 73, HYAMS 73, GRAYER 74, ROSSELET 77, CASON 83, ASTON 88, and ARMSTRONG 91B. Coupled channel analysis with flavor symmetry and all light two-pseudoscalars systems.

26 Also observed by ASNER 00 in $\tau^- \rightarrow \pi^- \pi^0 \pi^0 \nu_\tau$ decays

27 Width defined as distance between 45 and 135° phase shift.

NODE=M147210

NODE=M147W
→ UNCHECKED ←NODE=M147W1
NODE=M147W1NODE=M147W1;LINKAGE=NS
NODE=M147W1;LINKAGE=UE
NODE=M147W1;LINKAGE=GR
NODE=M147W1;LINKAGE=BBNODE=M147W1;LINKAGE=FF
NODE=M147W1;LINKAGE=ENODE=M147W2
NODE=M147W2

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

121± 15 VLADIMIRSK...06 SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$

55± 26 TIKHOMIROV 03 SPEC $40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$

250± 80 BOLONKIN 88 SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$

118₋⁺¹³⁸ 16 ETKIN 82B MPS $23 \pi^- p \rightarrow n 2 K_S^0$

160± 30 WICKLUND 80 SPEC $6 \pi N \rightarrow K^+ K^- N$

~ 150 POLYCHRO... 79 STRC $7 \pi^- p \rightarrow n 2 K_S^0$

NODE=M147W3
NODE=M147W3

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

275±55 ABELE 01 CBAR $0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$

375±61 AMSLER 94 CBAR $0.0 \bar{p}p \rightarrow \pi^+ \pi^- 3\pi^0$

398±26 ADAMO 93 OBLX $\bar{n}p \rightarrow 3\pi^+ 2\pi^-$

310±50 GASPERO 93 DBC $0.0 \bar{p}n \rightarrow 2\pi^+ 3\pi^-$

~ 90 5751 28 BETTINI 66 DBC $0.0 \bar{p}n \rightarrow 2\pi^+ 3\pi^-$

28 $\rho\rho$ dominant.

NODE=M147W3;LINKAGE=BE

$\eta\eta$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
484 $^{+246}_{-170}$ $^{+246}_{-263}$	29 UEHARA	10A BELL	10.6 $e^+ e^- \rightarrow e^+ e^- \eta\eta$
250	AMSLER	92 CBAR	0.0 $\bar{p}p \rightarrow \pi^0 \eta\eta$
320 \pm 40	ALDE	86D GAM4	100 $\pi^- p \rightarrow n2\eta$
29 Breit-Wigner width. May also be the $f_0(1500)$.			

NODE=M147W4

NODE=M147W4

COUPLED CHANNEL MODE

VALUE (MeV)	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
147 $^{+30}_{-50}$	30 ANISOVICH	03 RVUE
30 K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K\bar{K}n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta\eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.		

NODE=M147W4;LINKAGE=UE

NODE=M147W5

NODE=M147W5

 $f_0(1370)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	seen
$\Gamma_2 4\pi$	seen
$\Gamma_3 4\pi^0$	seen
$\Gamma_4 2\pi^+ 2\pi^-$	seen
$\Gamma_5 \pi^+ \pi^- 2\pi^0$	seen
$\Gamma_6 \rho\rho$	dominant
$\Gamma_7 2(\pi\pi)_S$ -wave	seen
$\Gamma_8 \pi(1300)\pi$	seen
$\Gamma_9 a_1(1260)\pi$	seen
$\Gamma_{10} \eta\eta$	seen
$\Gamma_{11} K\bar{K}$	seen
$\Gamma_{12} K\bar{K}n\pi$	not seen
$\Gamma_{13} 6\pi$	not seen
$\Gamma_{14} \omega\omega$	not seen
$\Gamma_{15} \gamma\gamma$	seen
$\Gamma_{16} e^+ e^-$	not seen

NODE=M147215;NODE=M147

 $f_0(1370)$ PARTIAL WIDTHS **$\Gamma(\gamma\gamma)$** **Γ_{15}** See $\gamma\gamma$ widths under $f_0(500)$ and MORGAN 90.

NODE=M147217

 $\Gamma(e^+ e^-)$ **Γ_{16}**

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<20	90	VOROBIEV	88	ND $e^+ e^- \rightarrow \pi^0 \pi^0$

NODE=M147W11

NODE=M147W11

NODE=M147W11

NODE=M147W12

NODE=M147W12

 $f_0(1370) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$ **$\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$** **$\Gamma_{10}\Gamma_{15}/\Gamma$**

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			

NODE=M147225

121 $^{+133}_{-53}$ $^{+169}_{-106}$

31 UEHARA

10A BELL

10.6 $e^+ e^- \rightarrow e^+ e^- \eta\eta$ ³¹ Including interference with the $f'_2(1525)$ (parameters fixed to the values from the 2008 edition of this review, PDG 08) and $f_2(1270)$. May also be the $f_0(1500)$.

NODE=M147G01

NODE=M147G01

NODE=M147G01;LINKAGE=UE

$f_0(1370)$ BRANCHING RATIOS **$\Gamma(\pi\pi)/\Gamma_{\text{total}}$**

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.26±0.09	BUGG 32	96	RVUE	
<0.15	AMSLER 32	94	CBAR $\bar{p}p \rightarrow \pi^+ \pi^- 3\pi^0$	
<0.06	GASPERO 32	93	DBC 0.0 $\bar{p}n \rightarrow$ hadrons	
32 Using AMSLER 95B ($3\pi^0$).				

NODE=M147220

NODE=M147R3
NODE=M147R3

NODE=M147R3;LINKAGE=B

NODE=M147R4
NODE=M147R4 **$\Gamma(4\pi)/\Gamma_{\text{total}}$**

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_2/\Gamma = (\Gamma_3 + \Gamma_4 + \Gamma_5)/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
>0.72	GASPERO	93	DBC 0.0 $\bar{p}n \rightarrow$ hadrons	

NODE=M147R4
NODE=M147R4 **$\Gamma(4\pi^0)/\Gamma(4\pi)$**

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	ABELE 33	96	CBAR 0.0 $\bar{p}p \rightarrow 5\pi^0$	
0.068±0.005	GASPERO 33	93	DBC 0.0 $\bar{p}n \rightarrow$ hadrons	

NODE=M147R12
NODE=M147R12

33 Model-dependent evaluation.

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_4/\Gamma_2 = \Gamma_4/(\Gamma_3 + \Gamma_4 + \Gamma_5)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.420±0.014	GASPERO 34	93	DBC 0.0 $\bar{p}n \rightarrow 2\pi^+ 3\pi^-$	

NODE=M147R5;LINKAGE=GA

NODE=M147R5
NODE=M147R5 **$\Gamma(\pi^+\pi^-2\pi^0)/\Gamma(4\pi)$**

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_5/\Gamma_2 = \Gamma_5/(\Gamma_3 + \Gamma_4 + \Gamma_5)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.512±0.019	GASPERO 35	93	DBC 0.0 $\bar{p}n \rightarrow$ hadrons	

NODE=M147R6
NODE=M147R6

35 Model-dependent evaluation.

 $\Gamma(\rho\rho)/\Gamma(4\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.26±0.07	ABELE	01B	CBAR 0.0 $\bar{p}d \rightarrow 5\pi p$	

NODE=M147R17
NODE=M147R17 **$\Gamma(2(\pi\pi)s\text{-wave})/\Gamma(\pi\pi)$**

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ_1
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.6±2.6	ABELE 36	01	CBAR 0.0 $\bar{p}d \rightarrow \pi^- 4\pi^0 p$	

NODE=M147R15
NODE=M147R15

36 From the combined data of ABELE 96 and ABELE 96C.

NODE=M147R;LINKAGE=KZ

 $\Gamma(2(\pi\pi)s\text{-wave})/\Gamma(4\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.51±0.09	ABELE	01B	CBAR 0.0 $\bar{p}d \rightarrow 5\pi p$	

NODE=M147R16
NODE=M147R16 **$\Gamma(\rho\rho)/\Gamma(2(\pi\pi)s\text{-wave})$**

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_7
• • • We do not use the following data for averages, fits, limits, etc. • • •				
large	BARBERIS	00C	450 $p p \rightarrow p_f 4\pi p_s$	
1.6 ± 0.2	AMSLER	94	CBAR $\bar{p}p \rightarrow \pi^+ \pi^- 3\pi^0$	
~ 0.65	GASPERO	93	DBC 0.0 $\bar{p}n \rightarrow$ hadrons	

NODE=M147R10
NODE=M147R10

OCCUR=2

 $\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_8/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.17±0.06	ABELE	01B	CBAR 0.0 $\bar{p}d \rightarrow 5\pi p$	

NODE=M147R18
NODE=M147R18

$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_9/Γ_2
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.06±0.02

ABELE

01B

CBAR

0.0 $\bar{p}d \rightarrow 5\pi p$ $\Gamma(\eta\eta)/\Gamma(4\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_{10}/\Gamma_2 = \Gamma_{10}/(\Gamma_3 + \Gamma_4 + \Gamma_5)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

 $(28 \pm 11) \times 10^{-3}$
 $(4.7 \pm 2.0) \times 10^{-3}$

37 ANISOVICH

02D

SPEC

Combined fit

BARBERIS

00E

 $450 pp \rightarrow p_f \eta\eta p_s$

37 From a combined K-matrix analysis of Crystal Barrel (0. $p\bar{p} \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \rightarrow \pi^0\pi^0n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \rightarrow K\bar{K}n$) data.

 $\Gamma(K\bar{K})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.35±0.13

BUGG

96

RVUE

 $\Gamma(K\bar{K})/\Gamma(\pi\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ_1
-------	-------------	------	---------	------------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.08±0.08

ABLIKIM

05

BES2

 $J/\psi \rightarrow \phi\pi^+\pi^-$, ϕK^+K^-

0.91±0.20

38 BARGIOTTI

03

OBLX

 $\bar{p}p$

0.12±0.06

39 ANISOVICH

02D

SPEC

Combined fit

0.46±0.15±0.11

BARBERIS

99D

OMEG

 $450 pp \rightarrow K^+K^-$, $\pi^+\pi^-$

38 Coupled channel analysis of $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, and $K^\pm K_S^0\pi^\mp$.

39 From a combined K-matrix analysis of Crystal Barrel (0. $p\bar{p} \rightarrow \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$), GAMS ($\pi p \rightarrow \pi^0\pi^0n$, $\eta\eta n$, $\eta\eta' n$), and BNL ($\pi p \rightarrow K\bar{K}n$) data.

 $\Gamma(K\bar{K}n\pi)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
-------	-------------	------	---------	----------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.03

GASPERO

93

DBC

0.0 $\bar{p}n \rightarrow$ hadrons $\Gamma(6\pi)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
-------	-------------	------	---------	----------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.22

GASPERO

93

DBC

0.0 $\bar{p}n \rightarrow$ hadrons $\Gamma(\omega\omega)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{14}/Γ
-------	-------------	------	---------	----------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.13

GASPERO

93

DBC

0.0 $\bar{p}n \rightarrow$ hadrons $f_0(1370)$ REFERENCES

UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
AUBERT	09L	PR D79 072006	B. Aubert <i>et al.</i>	(BABAR Collab.)
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
UEHARA	08A	PR D78 052004	S. Uehara <i>et al.</i>	(BELLE Collab.)
BONVICINI	07	PR D76 012001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
BUGG	07A	JPG 34 151	D.V. Bugg <i>et al.</i>	
GARMASH	07	PR D75 012006	A. Garmash <i>et al.</i>	(BELLE Collab.)
GARMASH	06	PRL 96 251803	A. Garmash <i>et al.</i>	(BELLE Collab.)
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
VLADIMIRSK...	06	PAN 69 493	V.V. Vladimirska <i>et al.</i>	(ITEP, Moscow)
		Translated from YAF 69 515.		
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
GARMASH	05	PR D71 092003	A. Garmash <i>et al.</i>	(BELLE Collab.)
ANISOVICH	03	EPJ A16 229	V.V. Anisovich <i>et al.</i>	
BARGIOTTI	03	EPJ C26 371	M. Bargiotti <i>et al.</i>	(OBELIX Collab.)
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>	
		Translated from YAF 66 860.		
ANISOVICH	02D	PAN 65 1545	V.V. Anisovich <i>et al.</i>	
		Translated from YAF 65 1583.		

REFID=53641

REFID=52719

REFID=52723

REFID=52166

REFID=52309

REFID=51721

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NODE=M147R14

NODE=M147R14

NODE=M147R11

NODE=M147R11

NODE=M147R13

NODE=M147R13

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NODE=M147R;LINKAGE=CH

NODE=M147R20

NODE=M147R20

NODE=M147R21

NODE=M147R21

NODE=M147R22

NODE=M147R22

NODE=M147

ABELE	01	EPJ C19 667	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=48334
ABELE	01B	EPJ C21 261	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=48356
AITALA	01A	PRL 86 765	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)	REFID=48004
ASNER	00	PR D61 012002	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=47339
BARBERIS	00C	PL B471 440	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=47959
BARBERIS	00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=47961
BARBERIS	99B	PL B453 316	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46922
BARBERIS	99D	PL B462 462	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=47395
BELLAZZINI	99	PL B467 296	R. Bellazzini <i>et al.</i>		REFID=47400
KAMINSKI	99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN)	REFID=46927
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)	REFID=46605
Also		PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)	REFID=46914
		Translated from YAF 62 446.			
ANISOVICH	98B	SPU 41 419	V.V. Anisovich <i>et al.</i>		REFID=46331
		Translated from UFN 168 481.			
BERTIN	98	PR D57 55	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45782
BARBERIS	97B	PL B413 217	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=45758
BERTIN	97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45701
ABELE	96	PL B380 453	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=45011
ABELE	96B	PL B385 425	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=45038
ABELE	96C	NP A609 562	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=45076
BUGG	96	NP B471 59	D.V. Bugg, A.V. Sarantsev, B.S. Zou	(LOQM, PNPI)	REFID=45094
AMSLER	95B	PL B342 433	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44377
AMSLER	95C	PL B353 571	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44440
AMSLER	95D	PL B355 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44441
JANSSEN	95	PR D52 2690	G. Janssen <i>et al.</i>	(STON, ADLD, JULI)	REFID=44508
TORNQVIST	95	ZPHY C68 647	N.A. Tornqvist	(HELS)	REFID=44529
AMSLER	94	PL B322 431	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.) JPC	REFID=43660
AMSLER	94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44093
ANISOVICH	94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.) JPC	REFID=43659
BUGG	94	PR D50 4412	D.V. Bugg <i>et al.</i>	(LOQM)	REFID=44078
KAMINSKI	94	PR D50 3145	R. Kaminski, L. Lesniak, J.P. Maillet	(CRAC+)	REFID=45771
ADAMO	93	NP A558 13C	A. Adamo <i>et al.</i>	(OBELIX Collab.) JPC	REFID=43657
GASPERO	93	NP A562 407	M. Gaspero	(ROMAI) JPC	REFID=43658
AMSLER	92	PL B291 347	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=43169
ARMSTRONG	91	ZPHY C51 351	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41744
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41862
BREAKSTONE	90	ZPHY C48 569	A.M. Breakstone <i>et al.</i>	(ISU, BGNA, CERN+)	REFID=41376
MORGAN	90	ZPHY C48 623	D. Morgan, M.R. Pennington	(RAL, DURH)	REFID=41583
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=40262
BOLONKIN	88	NP B309 426	B.V. Bolonkin <i>et al.</i>	(ITEP, SERP)	REFID=40580
FALVARD	88	PR D38 2706	A. Falvard <i>et al.</i>	(CLER, FRAS, LALO+)	REFID=40576
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev <i>et al.</i>	(NOVO)	REFID=41023
		Translated from YAF 48 436.			
AU	87	PR D35 1633	K.L. Au, D. Morgan, M.R. Pennington	(DURH, RAL)	REFID=40064
AKESSON	86	NP B264 154	T. Akesson <i>et al.</i>	(Axial Field Spec. Collab.)	REFID=21123
ALDE	86D	NP B269 485	D.M. Alde <i>et al.</i>	(BELG, LAPP, SERP, CERN+)	REFID=20765
CASON	83	PR D28 1586	N.M. Cason <i>et al.</i>	(NDAM, ANL)	REFID=20752
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)	REFID=20390
WICKLUND	80	PRL 45 1469	A.B. Wicklund <i>et al.</i>	(ANL)	REFID=20383
BECKER	79	NP B151 46	H. Becker <i>et al.</i>	(MPIM, CERN, ZEEM, CRAC)	REFID=21084
POLYCHRO...	79	PR D19 1317	V.A. Polychronakos <i>et al.</i>	(NDAM, ANL)	REFID=20378
FROGGATT	77	NP B129 89	C.D. Froggatt, J.L. Petersen	(GLAS, NORD)	REFID=21072
ROSSELET	77	PR D15 574	L. Rosselet <i>et al.</i>	(GEVA, SACL)	REFID=11004
GRAYER	74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM)	REFID=20113
HYAMS	73	NP B64 134	B.D. Hyams <i>et al.</i>	(CERN, MPIM)	REFID=20107
OCHS	73	Thesis	W. Ochs	(MPIM, MUNI)	REFID=20349
BEIER	72B	PRL 29 511	E.W. Beier <i>et al.</i>	(PENN)	REFID=44530
BETTINI	66	NC 42A 695	A. Bettini <i>et al.</i>	(PADO, PISA)	REFID=21361

NODE=M109

 $h_1(1380)$

$I^G(J^{PC}) = ?^-(1^{+-})$

OMITTED FROM SUMMARY TABLE

Seen in partial-wave analysis of the $K\bar{K}\pi$ system. Needs confirmation.

NODE=M109

 $h_1(1380)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1386±19 OUR AVERAGE			
1440±60	ABELE	97H CBAR	$\bar{p}p \rightarrow K_L^0 K_S^0 \pi^0 \pi^0$
1380±20	ASTON	88C LASS	$11 K^- p \rightarrow K_S^0 K^\pm \pi^\mp \Lambda$

NODE=M109M

NODE=M109M

 $h_1(1380)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
91±30 OUR AVERAGE Error includes scale factor of 1.1.			
170±80	ABELE	97H CBAR	$\bar{p}p \rightarrow K_L^0 K_S^0 \pi^0 \pi^0$
80±30	ASTON	88C LASS	$11 K^- p \rightarrow K_S^0 K^\pm \pi^\mp \Lambda$

NODE=M109W

NODE=M109W

 $h_1(1380)$ DECAY MODES

NODE=M109215; NODE=M109

Mode
$\Gamma_1 K\bar{K}^*(892) + \text{c.c.}$

DESIG=1

 $h_1(1380)$ REFERENCES

ABELE	97H	PL B415 280	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ASTON	88C	PL B201 573	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)

NODE=M109

REFID=45765

REFID=40282

NODE=M111

 $\pi_1(1400)$

$I^G(J^{PC}) = 1^-(1^{-+})$

NODE=M111

See also the mini-review under non- $q\bar{q}$ candidates in PDG 06, Journal of Physics, G **33** 1 (2006). **$\pi_1(1400)$ MASS**

NODE=M111M

NODE=M111M

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1354 ±25 OUR AVERAGE Error includes scale factor of 1.8. See the ideogram below.					
1257 ±20	±25	23.5k	ADAMS	07B B852	$18 \pi^- p \rightarrow \eta \pi^0 n$
1384 ±20	±35	90k	SALVINI	04 OBLX	$\bar{p}p \rightarrow 2\pi^+ 2\pi^-$
1360 ±25			ABELE	99 CBAR	$0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \eta$
1400 ±20	±20		ABELE	98B CBAR	$0.0 \bar{p}n \rightarrow \pi^- \pi^0 \eta$
1370 ±16	±50		¹ THOMPSON	97 MPS	$18 \pi^- p \rightarrow \eta \pi^- p$

NODE=M111M

NODE=M111M

• • • We do not use the following data for averages, fits, limits, etc. • • •

1323.1 ± 4.6	² AOYAGI	93 BKEI	$\pi^- p \rightarrow \eta \pi^- p$
1406 ±20	³ ALDE	88B GAM4 0	$100 \pi^- p \rightarrow \eta \pi^0 n$

NODE=M111M;LINKAGE=B

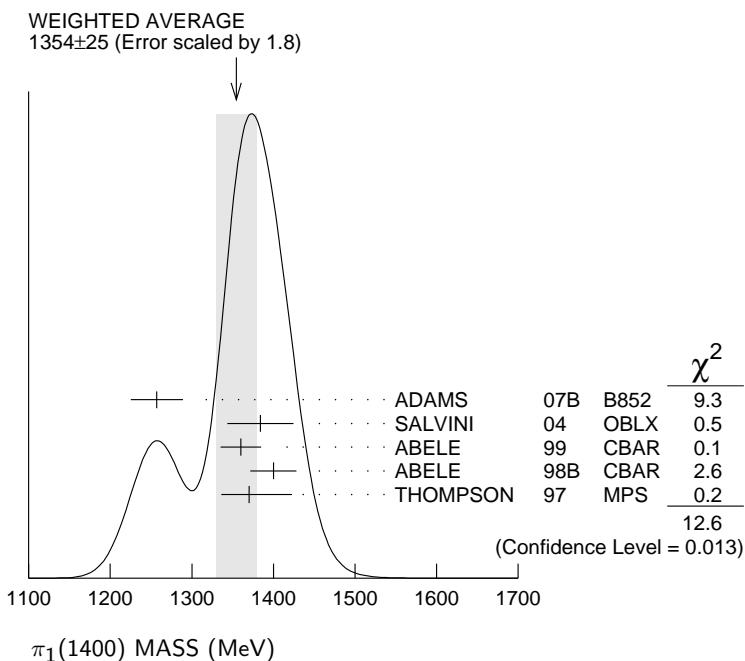
NODE=M111M;LINKAGE=C

NODE=M111M;LINKAGE=A

1 Natural parity exchange, questioned by DZIERBA 03.

2 Unnatural parity exchange.

3 Seen in the P_0 -wave intensity of the $\eta \pi^0$ system, unnatural parity exchange.

 **$\pi_1(1400)$ MASS (MeV)** **$\pi_1(1400)$ WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
330 ±35 OUR AVERAGE					
354 ±64	± 58	23.5k	ADAMS	07B	$18 \pi^- p \rightarrow \eta \pi^0 n$
378 ±50	± 50	90k	SALVINI	04	$\bar{p} p \rightarrow 2\pi^+ 2\pi^-$
220 ±90			ABELE	99	$0.0 \bar{p} p \rightarrow \pi^0 \pi^0 \eta$
310 ±50	± 50		ABELE	98B	$0.0 \bar{p} n \rightarrow \pi^- \pi^0 \eta$
385 ±40	± 65		⁴ THOMPSON 97		$18 \pi^- p \rightarrow \eta \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
143.2±12.5			⁵ AOYAGI 93		$\pi^- p \rightarrow \eta \pi^- p$
180 ±20			⁶ ALDE 88B		$100 \pi^- p \rightarrow \eta \pi^0 n$

⁴ Resolution is not unfolded, natural parity exchange, questioned by DZIERBA 03.⁵ Unnatural parity exchange.⁶ Seen in the P_0 -wave intensity of the $\eta \pi^0$ system, unnatural parity exchange.

NODE=M111W

NODE=M111W

NODE=M111W;LINKAGE=QQ

NODE=M111W;LINKAGE=C

NODE=M111W;LINKAGE=A

NODE=M111215;NODE=M111

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=3

NODE=M111220

NODE=M111R1

NODE=M111R1

 $\pi_1(1400)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \eta \pi^0$	seen
$\Gamma_2 \eta \pi^-$	seen
$\Gamma_3 \eta' \pi$	

 $\pi_1(1400)$ BRANCHING RATIOS

$\Gamma(\eta \pi^0)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	CHG	COMMENT	Γ_1/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen	PROKOSHIN 95B	GAM4		$100 \pi^- p \rightarrow \eta \pi^0 n$	
not seen	⁷ BUGG 94		RVUE	$\bar{p} p \rightarrow \eta 2\pi^0$	
not seen	⁸ APEL 81		NICE 0	$40 \pi^- p \rightarrow \eta \pi^0 n$	

⁷ Using Crystal Barrel data.⁸ A general fit allowing S , D , and P waves (including $m=0$) is not done because of limited statistics.

NODE=M111R1;LINKAGE=C

NODE=M111R1;LINKAGE=B

$\Gamma(\eta\pi^-)/\Gamma_{\text{total}}$		Γ_2/Γ	
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
possibly seen	BELADIDZE 93	VES $37\pi^- N \rightarrow \eta\pi^- N$	
$\Gamma(\eta'\pi)/\Gamma(\eta\pi^0)$		Γ_3/Γ_1	
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<0.80	95	BOUTEMEUR 90	GAM4 $100\pi^- p \rightarrow 4\gamma n$

$\pi_1(1400)$ REFERENCES

ADAMS 07B	PL B657 27	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)
PDG 06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
SALVINI 04	EPJ C35 21	P. Salvini <i>et al.</i>	(OBELIX Collab.)
DZIERBA 03	PR D67 094015	A.R. Dzierba <i>et al.</i>	
ABELE 99	PL B446 349	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ABELE 98B	PL B423 175	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
THOMPSON 97	PRL 79 1630	D.R. Thompson <i>et al.</i>	(BNL E852 Collab.)
PROKOSHKIN 95B	PAN 58 606	Y.D. Prokoshkin, S.A. Sadovsky	(SERP)
	Translated from YAF 58 662.		
BUGG 94	PR D50 4412	D.V. Bugg <i>et al.</i>	(LOQM)
AOYAGI 93	PL B314 246	H. Aoyagi <i>et al.</i>	(BKEI Collab.)
BELADIDZE 93	PL B313 276	G.M. Beladidze <i>et al.</i>	(VES Collab.)
BOUTEMEUR 90	Hadron 89 Conf. p 119	M. Boutemeur, M. Poulet	(SERP, BELG, LANL+)
ALDE 88B	PL B205 397	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP) IJPC
APEL 81	NP B193 269	W.D. Apel <i>et al.</i>	(SERP, CERN)

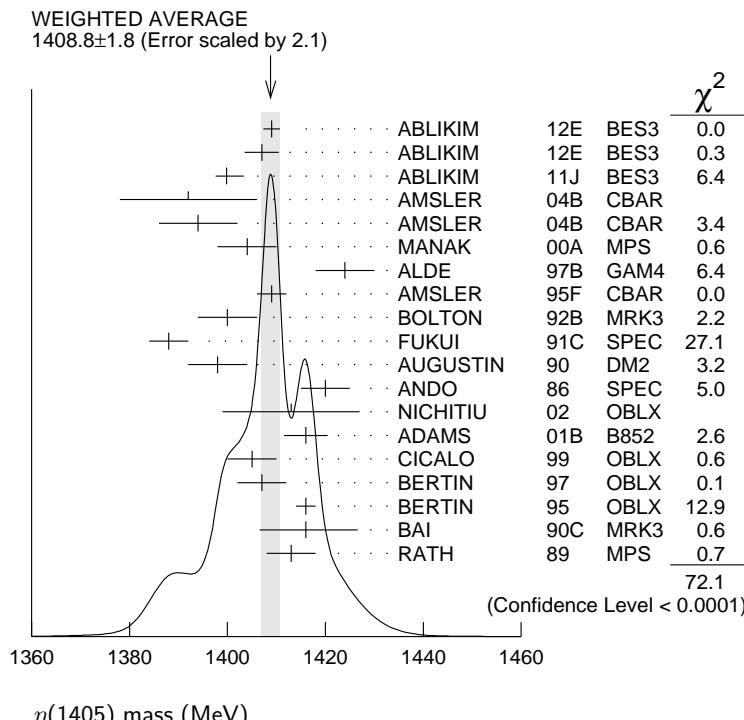
$\eta(1405)$

$$I^G(J^{PC}) = 0^+(0^-+)$$

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$\eta(1405)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>	
1408.8 ± 1.8 OUR AVERAGE		Includes data from the 2 datablocks that follow this one. Error includes scale factor of 2.1. See the ideogram below. [1408.9 ± 2.4 MeV OUR 2012 AVERAGE Scale factor = 2.3]	



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NODE=M111R4

NODE=M111R3
NODE=M111R3

NODE=M111

REFID=52048
REFID=51004
REFID=53226
REFID=49412
REFID=46602
REFID=45864
REFID=45584
REFID=44619
REFID=44078
REFID=43599
REFID=43598
REFID=43591
REFID=41751
REFID=40558
REFID=22913

NODE=M027

NODE=M027

NODE=M027205

NODE=M027MX
NEW

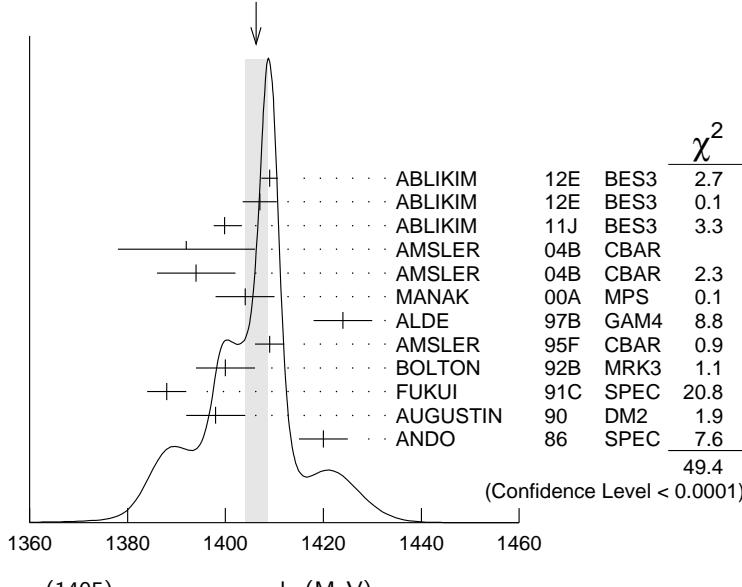
$\eta\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				

1406.2± 2.3 OUR AVERAGE Error includes scale factor of 2.2. See the ideogram below.
[1403.8^{+3.4}_{-3.0} MeV OUR 2012 AVERAGE Scale factor = 2.2]

1409.0± 1.7	743	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^0)$
1407.0± 3.5	198	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma(\pi^0\pi^0\pi^0)$
1399.8± 2.2 ^{+2.8} _{-0.1}	1	ABLIKIM	11J BES3	$J/\psi \rightarrow \omega(\eta\pi^+\pi^-)$
1392 ± 14	900 ± 375	AMSLER	04B CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\eta$
1394 ± 8	6.6 ± 2.0k	AMSLER	04B CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$
1404 ± 6	9082	MANAK	00A MPS	$18\pi^-p \rightarrow \eta\pi^+\pi^-n$
1424 ± 6	2200	ALDE	97B GAM4	$100\pi^-p \rightarrow \eta\pi^0\pi^0n$
1409 ± 3		AMSLER	95F CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$
1400 ± 6	2	BOLTON	92B MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
1388 ± 4		FUKUI	91C SPEC	$8.95\pi^-p \rightarrow \eta\pi^+\pi^-n$
1398 ± 6	261	3 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
1420 ± 5		ANDO	86 SPEC	$8\pi^-p \rightarrow \eta\pi^+\pi^-n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1385 ± 7		BAI	99 BES	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$

WEIGHTED AVERAGE
1406.2±2.3 (Error scaled by 2.2)



$\eta(1405)$ mass, $\eta\pi\pi$ mode (MeV)

 $K\bar{K}\pi$ MODE ($a_0(980)\pi$ or direct $K\bar{K}\pi$)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				

1413.9± 1.7 OUR AVERAGE Error includes scale factor of 1.1.

1413 ± 14	3651	4 NICHITIU	02 OBLX	
1416 ± 4 ± 2	20k	ADAMS	01B B852	$18\text{ GeV }\pi^-p \rightarrow K^+K^-\pi^0n$
1405 ± 5		5 CICALO	99 OBLX	$0\bar{p}p \rightarrow K^\pm K_S^0\pi^\mp\pi^+\pi^-$
1407 ± 5		5 BERTIN	97 OBLX	$0\bar{p}p \rightarrow K^\pm(K^0)\pi^\mp\pi^+\pi^-$
1416 ± 2		5 BERTIN	95 OBLX	$0\bar{p}p \rightarrow K\bar{K}\pi\pi$
1416 ± 8 ± 7	700	6 BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm\pi^\mp$
1413 ± 5		6 RATH	89 MPS	$21.4\pi^-p \rightarrow n K_S^0 K_S^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1459 ± 5		7 AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$

 $\pi\pi\gamma$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				

1390±12	235 ± 91	AMSLER	04B CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1424±10±11	547	BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
1401±18	8,9	AUGUSTIN	90 DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
1432± 8	9	COFFMAN	90 MRK3	$J/\psi \rightarrow \pi^+\pi^-2\gamma$

NODE=M027M1

NODE=M027M1

NEW

OCCUR=2

OCCUR=2

OCCUR=2

OCCUR=3

NODE=M027M2

NODE=M027M2

OCCUR=4

4π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1420 \pm 20		BUGG 95	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$
1489 \pm 12	3270	10 BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$

NODE=M027M3

NODE=M027M3

 $K\bar{K}\pi$ MODE (unresolved)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1437.6 \pm 3.2	249 \pm 35	11,12 ABLIKIM	08E BES2	$J/\psi \rightarrow \omega K_S^0 K^+ \pi^- + c.c.$
1445.9 \pm 5.7	62 \pm 18	11,12 ABLIKIM	08E BES2	$J/\psi \rightarrow \omega K^+ K^- \pi^0$
1442 \pm 10	410	11 BAI	98C BES	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1445 \pm 8	693	11 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1433 \pm 8	296	11 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1413 \pm 8	500	11 DUCH	89 ASTE	$\bar{p}p \rightarrow \pi^+ \pi^- K^\pm \pi^\mp K^0$
1453 \pm 7	170	11 RATH	89 MPS	$21.4 \pi^- p \rightarrow K_S^0 K_S^0 \pi^0 n$
1419 \pm 1	8800	11 BIRMAN	88 MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
1424 \pm 3	620	11 REEVES	86 SPEC	$6.6 p\bar{p} \rightarrow K\bar{K}\pi X$
1421 \pm 2		11 CHUNG	85 SPEC	$8 \pi^- p \rightarrow K\bar{K}\pi n$
1440 \pm 20 -15	174	11 EDWARDS	82E CBAL	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
1440 \pm 10 -15		11 SCHARRE	80 MRK2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1425 \pm 7	800	11,13 BAILLON	67 HBC	$0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$

NODE=M027M6

NODE=M027M6

1 The selected process is $J/\psi \rightarrow \omega a_0(980)\pi$.2 From fit to the $a_0(980)\pi^-$ partial wave.

3 Best fit with a single Breit Wigner.

4 Decaying dominantly directly to $K^+ K^- \pi^0$.5 Decaying into $(K\bar{K})_S \pi$, $(K\pi)_S \bar{K}$, and $a_0(980)\pi$.6 From fit to the $a_0(980)\pi^-$ partial wave. Cannot rule out a $a_0(980)\pi^+$ partial wave.

7 Excluded from averaging because averaging would be meaningless.

8 Best fit with a single Breit Wigner.

9 This peak in the $\gamma\rho$ channel may not be related to the $\eta(1405)$.

10 Estimated by us from various fits.

11 These experiments identify only one pseudoscalar in the 1400–1500 range. Data could also refer to $\eta(1475)$.

12 Systematic uncertainty not evaluated.

13 From best fit of 0^- partial wave, 50% $K^*(892)K$, 50% $a_0(980)\pi$.

NODE=M027M1;LINKAGE=BL

NODE=M027M1;LINKAGE=J1

NODE=M027M1;LINKAGE=A1

NODE=M027M;LINKAGE=NC

NODE=M027M4;LINKAGE=FX

NODE=M027M4;LINKAGE=C2

NODE=M027M4;LINKAGE=AA

NODE=M027M2;LINKAGE=E

NODE=M027M2;LINKAGE=X

NODE=M027M3;LINKAGE=E

NODE=M027M;LINKAGE=NP

NODE=M027M;LINKAGE=NS

NODE=M027M6;LINKAGE=H

NODE=M027210

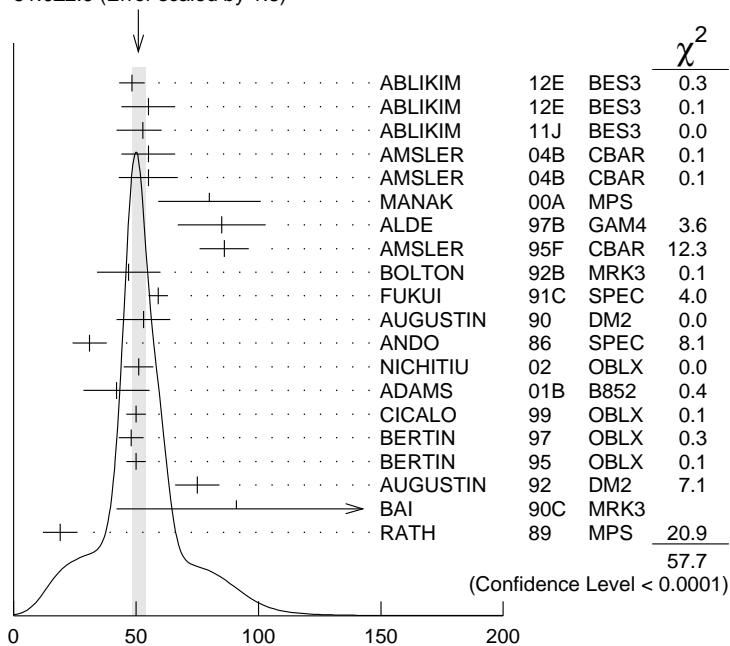
NODE=M027WX

NEW

 $\eta(1405)$ WIDTH

VALUE (MeV)	DOCUMENT ID
51.0 \pm 2.9 OUR AVERAGE	Includes data from the 2 datablocks that follow this one. Error includes scale factor of 1.8. See the ideogram below. [51.1 \pm 3.2 MeV OUR 2012 AVERAGE Scale factor = 2.0]

WEIGHTED AVERAGE
51.0±2.9 (Error scaled by 1.8)



$\eta(1405)$ width (MeV)

$\eta\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	------	-------------	------	---------

The data in this block is included in the average printed for a previous datablock.

NODE=M027W1
NODE=M027W1

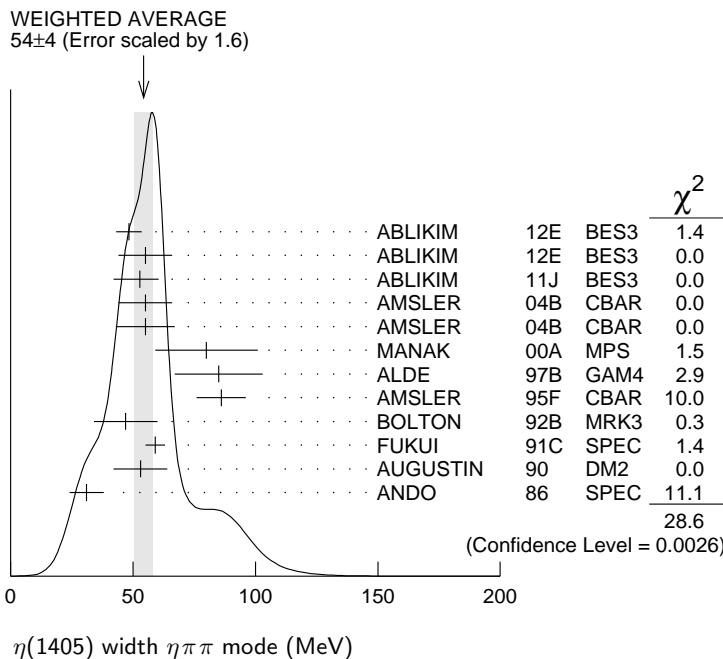
54 ± 4 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.
[56 ± 5 MeV OUR 2012 AVERAGE Scale factor = 1.7]

NEW

48.3± 5.2	743	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^0)$	
55.0±11.0	198	ABLIKIM	12E BES3	$J/\psi \rightarrow \gamma(\pi^0\pi^0\pi^0)$	
52.8± 7.6 ^{+0.1} _{-7.6}	14	ABLIKIM	11J BES3	$J/\psi \rightarrow \omega(\eta\pi^+\pi^-)$	
55 ±11	900 ± 375	AMSLER	04B CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\eta$	
55 ±12	6.6 ± 2.0k	AMSLER	04B CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\gamma$	OCCUR=2
80 ±21	9082	MANAK	00A MPS	$18\pi^-p \rightarrow \eta\pi^+\pi^-n$	
85 ±18	2200	ALDE	97B GAM4	$100\pi^-p \rightarrow \eta\pi^0\pi^0n$	
86 ±10		AMSLER	95F CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^0\pi^0\eta$	
47 ±13		15 BOLTON	92B MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	
59 ± 4		FUKUI	91C SPEC	$8.95\pi^-p \rightarrow \eta\pi^+\pi^-n$	
53 ±11		16 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	
31 ± 7		ANDO	86 SPEC	$8\pi^-p \rightarrow \eta\pi^+\pi^-n$	

OCCUR=2

OCCUR=2



$K\bar{K}\pi$ MODE ($a_0(980)\pi$ or direct $K\bar{K}\pi$)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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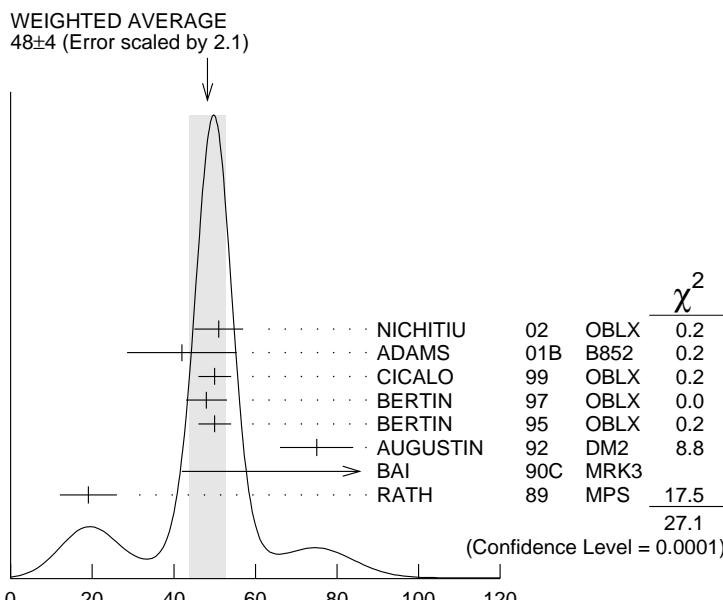
NODE=M027W4
NODE=M027W4

The data in this block is included in the average printed for a previous datablock.

48± 4 OUR AVERAGE Error includes scale factor of 2.1. See the ideogram below.

51 ± 6	3651	17 NICHITIU	02 OBLX	
42±10± 9	20k	ADAMS	01B B852	$18 \text{ GeV } \pi^- p \rightarrow K^+ K^- \pi^0 n$
50 ± 4		CICALO	99 OBLX	$0 \bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp \pi^+ \pi^-$
48 ± 5		18 BERTIN	97 OBLX	$0.0 \bar{p}p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
50 ± 4		18 BERTIN	95 OBLX	$0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$
75 ± 9		AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$
91 ⁺⁶⁷ ₋₃₁ ⁺¹⁵ ₋₃₈		19 BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
19 ± 7		19 RATH	89 MPS	$21.4 \pi^- p \rightarrow n K_S^0 K_S^0 \pi^0$

OCCUR=2
OCCUR=3



$\pi\pi\gamma$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
64 ±18	235 ± 91	AMSLER	04B CBAR	$0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^+ \pi^- \gamma$

NODE=M027W2
NODE=M027W2

• • • We do not use the following data for averages, fits, limits, etc. • • •

101.0 ± 8.8 ± 8.8	547	BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
174 ± 44		AUGUSTIN	90 DM2	$J/\psi \rightarrow \pi^+\pi^-\gamma\gamma$
90 ± 26	20	COFFMAN	90 MRK3	$J/\psi \rightarrow \pi^+\pi^-2\gamma$

4π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
160 ± 30		BUGG	95 MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$
144 ± 13	3270	21 BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$

K $\bar{K}\pi$ MODE (unresolved)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
48.9 ± 9.0	249 ± 35	22,23 ABLIKIM	08E BES2	$J/\psi \rightarrow \omega K_S^0 K^+ \pi^- + c.c.$
34.2 ± 18.5	62 ± 18	22,23 ABLIKIM	08E BES2	$J/\psi \rightarrow \omega K^+ K^- \pi^0$
93 ± 14	296	22 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
105 ± 10	693	22 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
62 ± 16	500	22 DUCH	89 ASTE	$\bar{p}p \rightarrow K\bar{K}\pi\pi\pi$
100 ± 11	170	22 RATH	89 MPS	$21.4 \pi^- p \rightarrow K_S^0 K_S^0 \pi^0$
66 ± 2	8800	22 BIRMAN	88 MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
60 ± 10	620	22 REEVES	86 SPEC	$6.6 p\bar{p} \rightarrow K\bar{K}\pi X$
60 ± 10		22 CHUNG	85 SPEC	$8 \pi^- p \rightarrow K\bar{K}\pi n$
55 ± 20	174	22 EDWARDS	82E CBAL	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$
50 ± 30		22 SCHARRE	80 MRK2	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
80 ± 10	800	22,24 BAILLON	67 HBC	$0.0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$

14 The selected process is $J/\psi \rightarrow \omega a_0(980)\pi$.

15 From fit to the $a_0(980)\pi$ 0^-+ partial wave.

16 From $\eta\pi^+\pi^-$ mass distribution - mainly $a_0(980)\pi^-$ no spin-parity determination available.

17 Decaying dominantly directly to $K^+ K^- \pi^0$.

18 Decaying into $(K\bar{K})_S\pi$, $(K\pi)_S\bar{K}$, and $a_0(980)\pi$.

19 From fit to the $a_0(980)\pi$ 0^-+ partial wave , but $a_0(980)\pi 1^{++}$ cannot be excluded.

20 This peak in the $\gamma\rho$ channel may not be related to the $\eta(1405)$.

21 Estimated by us from various fits.

22 These experiments identify only one pseudoscalar in the 1400–1500 range. Data could also refer to $\eta(1475)$.

23 Systematic uncertainty not evaluated.

24 From best fit to 0^-+ partial wave , 50% $K^*(892)K$, 50% $a_0(980)\pi$.

OCCUR=2

NODE=M027W3
NODE=M027W3

NODE=M027W6
NODE=M027W6

OCCUR=2

OCCUR=2

OCCUR=3

OCCUR=2

NODE=M027W1;LINKAGE=BL
NODE=M027W1;LINKAGE=A1
NODE=M027W1;LINKAGE=D1

NODE=M027W;LINKAGE=NC
NODE=M027W4;LINKAGE=FX
NODE=M027W4;LINKAGE=C
NODE=M027W2;LINKAGE=X
NODE=M027W3;LINKAGE=F2
NODE=M027W;LINKAGE=NP

NODE=M027W;LINKAGE=NS
NODE=M027W6;LINKAGE=H1

NODE=M027215;NODE=M027

DESIG=2;OUR EST;→ UNCHECKED ←
DESIG=5;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=9;OUR EST;→ UNCHECKED ←
DESIG=10;OUR EST;→ UNCHECKED ←
DESIG=6;OUR EST;→ UNCHECKED ←
DESIG=12
DESIG=7
DESIG=8;OUR EST;→ UNCHECKED ←
DESIG=13
DESIG=11;OUR EST;→ UNCHECKED ←

NODE=M027220

NODE=M027G3
NODE=M027G3

η(1405) DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 K\bar{K}\pi$	seen	
$\Gamma_2 \eta\pi\pi$	seen	
$\Gamma_3 a_0(980)\pi$	seen	
$\Gamma_4 \eta(\pi\pi)_S\text{-wave}$	seen	
$\Gamma_5 f_0(980)\eta$	seen	
$\Gamma_6 4\pi$	seen	
$\Gamma_7 \rho\rho$	<58 %	99.85%
$\Gamma_8 \gamma\gamma$	seen	
$\Gamma_9 \rho^0\gamma$	seen	
$\Gamma_{10} \phi\gamma$	seen	
$\Gamma_{11} K^*(892)K$	seen	

η(1405) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

Γ(K $\bar{K}\pi$) × Γ($\gamma\gamma$)/Γ _{total}	Γ ₁ Γ ₈ /Γ			
VALUE (keV)	CL %	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.035 90 25,26 AHOHE 05 CLE2 10.6 $e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$

$\Gamma(\eta\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_2\Gamma_8/\Gamma$
<u>VALUE (keV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.095	95	ACCIARRI	01G L3	183–202 $e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$	

$\Gamma(\rho^0\gamma) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_9\Gamma_8/\Gamma$
<u>VALUE (keV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.5	95	ALTHOFF	84E TASS	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-\gamma$	
------	----	---------	----------	---	--

25 Using $\eta(1405)$ mass and width 1410 MeV and 51 MeV, respectively.

26 Assuming three-body phase-space decay to $K_S^0 K^\pm \pi^\mp$.

$\eta(1405)$ BRANCHING RATIOS

$\Gamma(\eta\pi\pi)/\Gamma(K\bar{K}\pi)$					Γ_2/Γ_1
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.09±0.48	27	AMSLER	04B CBAR	0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^+\pi^-\eta$	
<0.5	90	EDWARDS	83B CBAL	$J/\psi \rightarrow \eta\pi\pi\gamma$	
<1.1	90	SCHARRE	80 MRK2	$J/\psi \rightarrow \eta\pi\pi\gamma$	
<1.5	95	FOSTER	68B HBC	0.0 $\bar{p}p$	

$\Gamma(\rho^0\gamma)/\Gamma(\eta\pi\pi)$					Γ_9/Γ_2
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

0.111±0.064

AMSLER 04B CBAR 0 $\bar{p}p$

$\Gamma(a_0(980)\pi)/\Gamma(K\bar{K}\pi)$					Γ_3/Γ_1
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

~0.15	28	BERTIN	95 OBLX	0 $\bar{p}p \rightarrow K\bar{K}\pi\pi\pi$	
~0.8	500	DUCH	89 ASTE	$\bar{p}p \rightarrow \pi^+\pi^-K^\pm\pi^\mp K^0$	
~0.75	28	REEVES	86 SPEC	6.6 $p\bar{p} \rightarrow KK\pi X$	

$\Gamma(a_0(980)\pi)/\Gamma(\eta\pi\pi)$					Γ_3/Γ_2
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.29±0.10	ABELE	98E CBAR	0 $p\bar{p} \rightarrow \eta\pi^0\pi^0\pi^0$		
0.19±0.04	2200	29 ALDE	97B GAM4	$100\pi^-p \rightarrow \eta\pi^0\pi^0n$	
0.56±0.04±0.03		29 AMSLER	95F CBAR	$0\bar{p}p \rightarrow \pi^+\pi^-\pi^0\eta$	

$\Gamma(a_0(980)\pi)/\Gamma(\eta(\pi\pi)s\text{-wave})$					Γ_3/Γ_4
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.91±0.12	ANISOVICH	01 SPEC	0.0 $\bar{p}p \rightarrow \eta\pi^+\pi^-\pi^+\pi^-$		
0.15±0.04	9082	30 MANAK	00A MPS	$18\pi^-p \rightarrow \eta\pi^+\pi^-n$	
0.70±0.12±0.20		31 BAI	99 BES	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	

$\Gamma(\rho^0\gamma)/\Gamma(K\bar{K}\pi)$					Γ_9/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

0.0152±0.0038

32 COFFMAN 90 MRK3 $J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$

$\Gamma(\eta(\pi\pi)s\text{-wave})/\Gamma(\eta\pi\pi)$					Γ_4/Γ_2
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.81±0.04	2200	ALDE	97B GAM4	$100\pi^-p \rightarrow \eta\pi^0\pi^0n$	
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$\Gamma(f_0(980)\eta)/\Gamma(\eta\pi\pi)$					Γ_5/Γ_2
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.32±0.07	33 ANISOVICH	00 SPEC	0.9–1.2 $\bar{p}p \rightarrow \eta 3\pi^0$		
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$\Gamma(\rho\rho)/\Gamma_{\text{total}}$					Γ_7/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

<0.58

99.85 27,34 AMSLER 04B CBAR 0 $\bar{p}p$

NODE=M027G5

NODE=M027G5

NODE=M027G8

NODE=M027G8

NODE=M027225

NODE=M027R3

NODE=M027R3

NODE=M027R12

NODE=M027R12

NODE=M027R4

NODE=M027R4

NODE=M027R2

NODE=M027R2

NODE=M027R8

NODE=M027R8

NODE=M027R10

NODE=M027R10

NODE=M027R13

NODE=M027R13

$\Gamma(K^*(892)K)/\Gamma(a_0(980)\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ_3
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.084±0.024 30 ADAMS 01B B852 18 GeV $\pi^- p \rightarrow K^+ K^- \pi^0 n$

 $\Gamma(\phi\gamma)/\Gamma(\rho^0\gamma)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{10}/Γ_9
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.77 95 35 BAI 04J BES2 $J/\psi \rightarrow \gamma\gamma K^+ K^-$

27 Using the data of BAILLON 67 on $\bar{p}p \rightarrow K\bar{K}\pi$.

28 Assuming that the $a_0(980)$ decays only into $K\bar{K}$.

29 Assuming that the $a_0(980)$ decays only into $\eta\pi$.

30 Statistical error only.

31 Assuming that the $a_0(980)$ decays only into $\eta\pi$.

32 Using $B(J/\psi \rightarrow \gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi) = 4.2 \times 10^{-3}$ and $B(J/\psi \rightarrow \gamma\eta(1405) \rightarrow \gamma\gamma\rho^0) = 6.4 \times 10^{-5}$ and assuming that the $\gamma\rho^0$ signal does not come from the $f_1(1420)$.

33 Using preliminary Crystal Barrel data.

34 Assuming that the $\eta(1405)$ decays are saturated by the $\pi\pi\eta$, $K\bar{K}\pi$ and $\rho\rho$ modes.

35 Calculated by us from $B(J/\psi \rightarrow \eta(1405)\gamma \rightarrow \phi\gamma\gamma) < 0.82 \times 10^{-4}$ and $B(J/\psi \rightarrow \eta(1405)\gamma \rightarrow \rho^0\gamma\gamma) = (1.07 \pm 0.17 \pm 0.11) \times 10^{-4}$.

NODE=M027R11
NODE=M027R11

 Γ_{10}/Γ_9

NODE=M027R14
NODE=M027R14

NODE=M027R3;LINKAGE=AM
NODE=M027R4;LINKAGE=C
NODE=M027R2;LINKAGE=A
NODE=M027R;LINKAGE=K3
NODE=M027R9;LINKAGE=BK
NODE=M027R7;LINKAGE=D

NODE=M027R10;LINKAGE=D
NODE=M027R13;LINKAGE=AM
NODE=M027R14;LINKAGE=BA

 $\eta(1405)$ REFERENCES

ABLIKIM	12E	PRL 108 182001	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54270
ABLIKIM	11J	PRL 107 182001	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53931
ABLIKIM	08E	PR D77 032005	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52143
AHOHE	05	PR D71 072001	R. Ahohe <i>et al.</i>	(CLEO Collab.)	REFID=50764
AMSLER	04B	EPJ C33 23	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=51079
BAI	04J	PL B594 47	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50167
NICHITIU	02	PL B545 261	F. Nichitiu <i>et al.</i>	(OBELIX Collab.)	REFID=48848
ACCIARRI	01G	PL B501 1	M. Acciari <i>et al.</i>	(L3 Collab.)	REFID=48319
ADAMS	01B	PL B516 264	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)	REFID=49649
ANISOVICH	01	NP A690 567	A.V. Anisovich <i>et al.</i>		REFID=48308
ANISOVICH	00	PL B472 168	A.V. Anisovich <i>et al.</i>		REFID=47429
MANAK	00A	PR D62 012003	J.J. Manak <i>et al.</i>	(BNL E852 Collab.)	REFID=47989
BAI	99	PL B446 356	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46606
CICALO	99	PL B462 453	C. Cicalo <i>et al.</i>	(OBELIX Collab.)	REFID=47394
ABELE	98E	NP B514 45	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=46314
BAI	98C	PL B440 217	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46337
ALDE	97B	PAN 60 386	D. Alde <i>et al.</i>	(GAMS Collab.)	REFID=45396
		Translated from YAF 60 458.			
BERTIN	97	PL B400 226	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45417
AMSLER	95F	PL B358 389	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	REFID=44613
BERTIN	95	PL B361 187	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=44614
BUGG	95	PL B353 378	D.V. Bugg <i>et al.</i>	(LOQM, PNPI, WASH)	REFID=44438
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41584
BOLTON	92B	PRL 69 1328	T. Bolton <i>et al.</i>	(Mark III Collab.)	REFID=42176
FUKUI	91C	PL B267 293	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)	REFID=41748
AUGUSTIN	90	PR D42 10	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=41352
BAI	90C	PRL 65 2507	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41578
COFFMAN	90	PR D41 1410	D.M. Coffman <i>et al.</i>	(Mark III Collab.)	REFID=41350
BISELLO	89B	PR D39 701	G. Busetto <i>et al.</i>	(DM2 Collab.)	REFID=40575
DUCH	89	ZPHY C45 223	K.D. Duch <i>et al.</i>	(ASTERIX Collab.)	REFID=41016
RATH	89	PR D40 693	M.G. Rath <i>et al.</i>	(NDAM, BRAN, BNL, CUNY+)	REFID=40924
BIRMAN	88	PRL 61 1557	A. Birman <i>et al.</i>	(BNL, FSU, IND, MASD)	REFID=40568
ANDO	86	PRL 57 1296	A. Ando <i>et al.</i>	(KEK, KYOT, NIRS, SAGA+)	REFID=20891
REEVES	86	PR D34 1960	D.F. Reeves <i>et al.</i>	(FLOR, BNL, IND+)	REFID=20936
CHUNG	85	PRL 55 779	S.U. Chung <i>et al.</i>	(BNL, FLOR, IND+)	REFID=20934
ALTHOFF	84E	PL 147B 487	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=20305
EDWARDS	83B	PRL 51 859	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21318
EDWARDS	82E	PL 49 259	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21314
Also		PRL 50 219	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21315
SCHARRE	80	PL 97B 329	D.L. Scharre <i>et al.</i>	(SLAC, LBL)	REFID=21329
FOSTER	68B	NP B8 174	M. Foster <i>et al.</i>	(CERN, CDEF)	REFID=21179
BAILLON	67	NC 50A 393	P.H. Baillon <i>et al.</i>	(CERN, CDEF, IRAD)	REFID=20407

NODE=M027

$f_1(1420)$ $I^G(J^{PC}) = 0^+(1^{++})$ See the minireview under $\eta(1405)$.

$f_1(1420)$ MASS					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1426.4 ± 0.9 OUR AVERAGE				Error includes scale factor of 1.1.	
1434 ± 5 ± 5	133	1 ACHARD	07 L3	$183\text{--}209 e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$	NODE=M006
1426 ± 6	711	ABDALLAH	03H DLPH	$91.2 e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp + X$	NODE=M006M2
1420 ± 14	3651	NICHITIU	02 OBLX		NODE=M006M2
1428 ± 4 ± 2	20k	ADAMS	01B B852	$18 \text{ GeV } \pi^- p \rightarrow K^+ K^- \pi^0 n$	
1426 ± 1		BARBERIS	97C OMEG	$450 pp \rightarrow pp K_S^0 K^\pm \pi^\mp$	
1425 ± 8		BERTIN	97 OBLX	$0.0 \bar{p}p \rightarrow K^\pm(K^0) \pi^\mp \pi^+ \pi^-$	
1435 ± 9		PROKOSHKIN	97B GAM4	$100 \pi^- p \rightarrow \eta \pi^0 \pi^0 n$	
1430 ± 4		2 ARMSTRONG	92E OMEG	$85,300 \pi^+ p, pp \rightarrow \pi^+ p, pp(K\bar{K}\pi)$	
1462 ± 20		3 AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$	
1443 $^{+7}_{-6}$ $^{+3}_{-2}$	1100	BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$	
1425 ± 10	17	BEHREND	89 CELL	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$	
1442 ± 5 $^{+10}_{-17}$	111	BECKER	87 MRK3	$e^+e^-, \omega K\bar{K}\pi$	
1423 ± 4		GIDAL	87B MRK2	$e^+e^- \rightarrow e^+e^- K\bar{K}\pi$	
1417 ± 13	13	AIHARA	86C TPC	$e^+e^- \rightarrow e^+e^- K\bar{K}\pi$	
1422 ± 3		CHAUVAT	84 SPEC	ISR 31.5 pp	
1440 ± 10		4 BROMBERG	80 SPEC	$100 \pi^- p \rightarrow K\bar{K}\pi X$	
1426 ± 6	221	DIONISI	80 HBC	$4 \pi^- p \rightarrow K\bar{K}\pi n$	
1420 ± 20		DAHL	67 HBC	$1.6\text{--}4.2 \pi^- p$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1430.8 ± 0.9		5 SOSA	99 SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^+ \pi^-) p_{\text{fast}}$	
1433.4 ± 0.8		5 SOSA	99 SPEC	$pp \rightarrow p_{\text{slow}} (K_S^0 K^- \pi^+) p_{\text{fast}}$	OCCUR=2
1429 ± 3	389	ARMSTRONG	89 OMEG	$300 pp \rightarrow K\bar{K}\pi pp$	
1425 ± 2	1520	ARMSTRONG	84 OMEG	$85 \pi^+ p, pp \rightarrow (\pi^+, p)(K\bar{K}\pi)p$	
~ 1420		BITYUKOV	84 SPEC	$32 K^- p \rightarrow K^+ K^- \pi^0 Y$	

¹ From a fit with a width fixed at 55 MeV.² This result supersedes ARMSTRONG 84, ARMSTRONG 89.³ From fit to the $K^*(892)K 1^{++}$ partial wave.⁴ Mass error increased to account for $a_0(980)$ mass cut uncertainties.⁵ No systematic error given.

$f_1(1420)$ WIDTH					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
54.9 ± 2.6 OUR AVERAGE					
51 ± 14	711	ABDALLAH	03H DLPH	$91.2 e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp + X$	NODE=M006
61 ± 8	3651	NICHITIU	02 OBLX		NODE=M006M2
38 ± 9 ± 6	20k	ADAMS	01B B852	$18 \text{ GeV } \pi^- p \rightarrow K^+ K^- \pi^0 n$	NODE=M006M2
58 ± 4		BARBERIS	97C OMEG	$450 pp \rightarrow pp K_S^0 K^\pm \pi^\mp$	NODE=M006M2
45 ± 10		BERTIN	97 OBLX	$0.0 \bar{p}p \rightarrow K^\pm(K^0) \pi^\mp \pi^+ \pi^-$	NODE=M006M2
90 ± 25		PROKOSHKIN	97B GAM4	$100 \pi^- p \rightarrow \eta \pi^0 \pi^0 n$	NODE=M006M2
58 ± 10		6 ARMSTRONG	92E OMEG	$85,300 \pi^+ p, pp \rightarrow \pi^+ p, pp(K\bar{K}\pi)$	NODE=M006M2

129	± 41		7 AUGUSTIN	92	DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$
68	$+29$	$+8$	-18	1100	BAI	90C MRK3 $J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
42	± 22			17	BEHREND	89 CELL $\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
40	$+17$	± 5		111	BECKER	87 MRK3 $e^+ e^- \rightarrow \omega K\bar{K}\pi$
35	$+47$		-20	13	AIHARA	86C TPC $e^+ e^- \rightarrow e^+ e^- K\bar{K}\pi$
47	± 10				CHAUVAT	84 SPEC ISR 31.5 pp
62	± 14				BROMBERG	80 SPEC $100 \pi^- p \rightarrow K\bar{K}\pi X$
40	± 15			221	DIONISI	80 HBC $4 \pi^- p \rightarrow K\bar{K}\pi n$
60	± 20				DAHL	67 HBC $1.6-4.2 \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
68.7 \pm 2.9				8 SOSA	99 SPEC	$pp \rightarrow p_{slow}$ $(K_S^0 K^+ \pi^-) p_{fast}$
58.8 \pm 3.3				8 SOSA	99 SPEC	$pp \rightarrow p_{slow}$ $(K_S^0 K^- \pi^+) p_{fast}$
58 \pm 8		389		ARMSTRONG	89 OMEG	$300 pp \rightarrow K\bar{K}\pi pp$
62 \pm 5		1520		ARMSTRONG	84 OMEG	$85 \pi^+ p, pp \rightarrow (\pi^+, p)(K\bar{K}\pi)p$
~ 50				BITYUKOV	84 SPEC	$32 K^- p \rightarrow K^+ K^- \pi^0 Y$

6 This result supersedes ARMSTRONG 84, ARMSTRONG 89.

7 From fit to the $K^*(892)K^- 1^{++}$ partial wave.

8 No systematic error given.

OCCUR=2

NODE=M006W;LINKAGE=C
NODE=M006W;LINKAGE=B
NODE=M006W;LINKAGE=N1

NODE=M006215;NODE=M006

f₁(1420) DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K\bar{K}\pi$	dominant
Γ_2 $K\bar{K}^*(892) + c.c.$	dominant
Γ_3 $\eta\pi\pi$	possibly seen
Γ_4 $a_0(980)\pi$	
Γ_5 $\pi\pi\rho$	
Γ_6 4π	
Γ_7 $\rho^0\gamma$	
Γ_8 $\phi\gamma$	seen

f₁(1420) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma^*)/\Gamma_{\text{total}}$	VALUE (keV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.9 \pm 0.4 OUR AVERAGE						
3.2 \pm 0.6 \pm 0.7		133	9,10	ACHARD	07 L3	$183-209 e^+ e^- \rightarrow e^+ e^- K_S^0 K^\pm \pi^\mp$
3.0 \pm 0.9 \pm 0.7			11,12	BEHREND	89 CELL	$e^+ e^- \rightarrow e^+ e^- K_S^0 K^\pm$
$2.3^{+1.0}_{-0.9} \pm 0.8$				HILL	89 JADE	$e^+ e^- \rightarrow e^+ e^- K^\pm K_S^0 \pi^\mp$
1.3 \pm 0.5 \pm 0.3				AIHARA	88B TPC	$e^+ e^- \rightarrow e^+ e^- K^\pm K_S^0 \pi^\mp$
1.6 \pm 0.7 \pm 0.3			11,13	GIDAL	87B MRK2	$e^+ e^- \rightarrow e^+ e^- K\bar{K}\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<8.0		95		JENNI	83 MRK2	$e^+ e^- \rightarrow e^+ e^- K\bar{K}\pi$

9 From a fit with a width fixed at 55 MeV.

10 The form factor parameter from the fit is 926 ± 78 MeV.

11 Assume a ρ -pole form factor.

12 A ϕ -pole form factor gives considerably smaller widths.

13 Published value divided by 2.

DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=5;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=4
DESIG=3
DESIG=6
DESIG=8
DESIG=9;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M006220

NODE=M006G2
NODE=M006G2

NODE=M006G2;LINKAGE=CH
NODE=M006G2;LINKAGE=CR
NODE=M006G2;LINKAGE=A
NODE=M006G2;LINKAGE=D
NODE=M006G2;LINKAGE=B

NODE=M006225

NODE=M006R1
NODE=M006R1

f₁(1420) BRANCHING RATIOS

$\Gamma(K\bar{K}^*(892)+c.c.)/\Gamma(K\bar{K}\pi)$	VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_1
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.76 \pm 0.06		BROMBERG	80	SPEC	$100 \pi^- p \rightarrow K\bar{K}\pi X$
0.86 \pm 0.12		DIONISI	80	HBC	$4 \pi^- p \rightarrow K\bar{K}\pi n$

$\Gamma(\pi\pi\rho)/\Gamma(K\bar{K}\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_5/Γ_1
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.3	95	CORDEN	78	OMEG 12–15 $\pi^- p$	NODE=M006R2
<2.0		DAHL	67	HBC 1.6–4.2 $\pi^- p$	NODE=M006R2

 $\Gamma(\eta\pi\pi)/\Gamma(K\bar{K}\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_3/Γ_1
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.1	95	ARMSTRONG	91B	OMEG 300 $p p \rightarrow p p \eta \pi^+ \pi^-$	NODE=M006R3
1.35 ± 0.75		KOPKE	89	MRK3 $J/\psi \rightarrow \omega \eta \pi \pi (K\bar{K}\pi)$	NODE=M006R3
<0.6	90	GIDAL	87	MRK2 $e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$	
<0.5	95	CORDEN	78	OMEG 12–15 $\pi^- p$	
1.5 ± 0.8		DEFOIX	72	HBC 0.7 $\bar{p} p \rightarrow 7\pi$	

 $\Gamma(a_0(980)\pi)/\Gamma(\eta\pi\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ_3
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
>0.1	90	PROKOSHKIN	97B	GAM4 100 $\pi^- p \rightarrow \eta \pi^0 \pi^0 n$	NODE=M006R4
not seen in either mode		ANDO	86	SPEC 8 $\pi^- p$	NODE=M006R4
not seen in either mode		CORDEN	78	OMEG 12–15 $\pi^- p$	
0.4 ± 0.2		DEFOIX	72	HBC 0.7 $\bar{p} p \rightarrow 7\pi$	

 $\Gamma(4\pi)/\Gamma(K\bar{K}^*(892)+c.c.)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_6/Γ_2
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.90	95	DIONISI	80	HBC 4 $\pi^- p$	NODE=M006R5

 $\Gamma(K\bar{K}\pi)/[\Gamma(K\bar{K}^*(892)+c.c.) + \Gamma(a_0(980)\pi)]$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_1/(\Gamma_2+\Gamma_4)$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
0.65 ± 0.27		¹⁴ DIONISI	80	HBC 4 $\pi^- p$	NODE=M006R6

¹⁴ Calculated using $\Gamma(K\bar{K})/\Gamma(\eta\pi) = 0.24 \pm 0.07$ for $a_0(980)$ fractions.

 $\Gamma(a_0(980)\pi)/\Gamma(K\bar{K}^*(892)+c.c.)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ_2
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
0.04 ± 0.01 ± 0.01		BARBERIS	98C	OMEG 450 $p p \rightarrow p_f f_1(1420) p_s$	NODE=M006R7

$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$

<0.04 68 ARMSTRONG 84 OMEG 85 $\pi^+ p$

 $\Gamma(4\pi)/\Gamma(K\bar{K}\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_6/Γ_1
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.62	95	ARMSTRONG	89G	OMEG 85 $\pi p \rightarrow 4\pi X$	NODE=M006R8

 $\Gamma(\rho^0\gamma)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ
$\bullet \bullet \bullet$ Using the data on the $\bar{K} K \pi$ mode from ARMSTRONG 89.					
<0.08	95	¹⁵ ARMSTRONG	92C	SPEC 300 $p p \rightarrow p p \pi^+ \pi^- \gamma$	NODE=M006R9

¹⁵ Using the data on the $\bar{K} K \pi$ mode from ARMSTRONG 89.

 $\Gamma(\rho^0\gamma)/\Gamma(K\bar{K}\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ_1
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.02	95	BARBERIS	98C	OMEG 450 $p p \rightarrow p_f f_1(1420) p_s$	NODE=M006R10

 $\Gamma(\phi\gamma)/\Gamma(K\bar{K}\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_8/Γ_1
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
0.003 ± 0.001 ± 0.001		BARBERIS	98C	OMEG 450 $p p \rightarrow p_f f_1(1420) p_s$	NODE=M006R11

f₁(1420) REFERENCES

ACHARD	07	JHEP 0703 018	P. Achard <i>et al.</i>	(L3 Collab.)	REFID=51698
ABDALLAH	03H	PL B569 129	J. Abdallah <i>et al.</i>	(DELPHI Collab.)	REFID=49548
NICHITIU	02	PL B545 261	F. Nichitiu <i>et al.</i>	(OBELIX Collab.)	REFID=48848
ADAMS	01B	PL B516 264	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)	REFID=49649
SOSA	99	PRL 83 913	M. Sosa <i>et al.</i>		REFID=46937
BARBERIS	98C	PL B440 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=46346
BARBERIS	97C	PL B413 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=45759
BERTIN	97	PL B400 226	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45417
PROKOSHKIN	97B	SPD 42 298	Yu.D. Prokoshkin, S.A. Sadovsky		REFID=45549
		Translated from DANS 354, 751.			
ARMSTRONG	92C	ZPHY C54 371	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=42097
ARMSTRONG	92E	ZPHY C56 29	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+) JPC	REFID=43173
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41584
ARMSTRONG	91B	ZPHY C52 389	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41862
BAI	90C	PRL 65 2507	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41578
ARMSTRONG	89	PL B221 216	T.A. Armstrong <i>et al.</i>	(CERN, CDEF, BIRM+) JPC	REFID=40729
ARMSTRONG	89G	ZPHY C43 55	T.A. Armstrong <i>et al.</i>	(CERN, BIRM, BARI+)	REFID=40930
BEHREND	89	ZPHY C42 367	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=40732
HILL	89	ZPHY C42 355	P. Hill <i>et al.</i>	(JADE Collab.) JP	REFID=40741
KOPKE	89	PRPL 174 67	L. Kopke <i>et al.</i>	(CERN)	REFID=41863
AIHARA	88B	PL B209 107	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)	REFID=40572
BECKER	87	PRL 59 186	J.J. Becker <i>et al.</i>	(Mark III Collab.) JP	REFID=40015
GIDAL	87	PRL 59 2012	G. Gidal <i>et al.</i>	(LBL, SLAC, HARV)	REFID=40223
GIDAL	87B	PRL 59 2016	G. Gidal <i>et al.</i>	(LBL, SLAC, HARV)	REFID=40224
AIHARA	86C	PRL 57 2500	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.) JP	REFID=21326
ANDO	86	PRL 57 1296	A. Ando <i>et al.</i>	(KEK, KYOT, NIRS, SAGA+)	REFID=20891
ARMSTRONG	84	PL 146B 273	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+) JP	REFID=20929
BITYUKOV	84	SJNP 39 735	S. Bityukov <i>et al.</i>	(SERP)	REFID=45856
		Translated from YAF 39 1165.			
CHAUVAT	84	PL 148B 382	P. Chauvat <i>et al.</i>	(CERN, CLER, UCLA+)	REFID=20932
JENNI	83	PR D27 1031	P. Jenni <i>et al.</i>	(SLAC, LBL)	REFID=20304
BROMBERG	80	PR D22 1513	C.M. Bromberg <i>et al.</i>	(CIT, FNAL, ILLC+)	REFID=20922
DIONISI	80	NP B169 1	C. Dionisi <i>et al.</i>	(CERN, MADR, CDEF+) IJP	REFID=20924
CORDEN	78	NP B144 253	M.J. Corden <i>et al.</i>	(BIRM, RHET, TELA+)	REFID=20452
DEFOIX	72	NP B44 125	C. Defoix <i>et al.</i>	(CDEF, CERN)	REFID=20435
DAHL	67	PR 163 1377	O.I. Dahl <i>et al.</i>	(LRL) IJP	REFID=20321
Also		PRL 14 1074	D.H. Miller <i>et al.</i>	(LRL, UCB)	REFID=21291

 $\omega(1420)$ $I^G(J^{PC}) = 0^-(1^- -)$ **$\omega(1420)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
(1400–1450) OUR ESTIMATE				

• • • We do not use the following data for averages, fits, limits, etc. • • •

1382 ± 23 ± 70		AUBERT	07AU	BABR 10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$
1350 ± 20 ± 20		AUBERT,B	04N	BABR 10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
1400 ± 50 ± 130	1.2M	¹ ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1450 ± 10		² HENNER	02	RVUE 1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
1373 ± 70	177	³ AKHMETSHIN	00D	CMD2 1.2–1.38 $e^+e^- \rightarrow \omega\pi^+\pi^-$
1370 ± 25	5095	ANISOVICH	00H	SPEC 0.0 $p\bar{p} \rightarrow \omega\pi^0\pi^0\pi^0$
1400 ⁺¹⁰⁰ ₋₂₀₀		⁴ ACHASOV	98H	RVUE $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
~1400		⁵ ACHASOV	98H	RVUE $e^+e^- \rightarrow \omega\pi^+\pi^-$
~1460		⁶ ACHASOV	98H	RVUE $e^+e^- \rightarrow K^+K^-$
1440 ± 70		⁷ CLEGG	94	RVUE
1419 ± 31	315	⁸ ANTONELLI	92	DM2 1.34–2.4 $e^+e^- \rightarrow \rho\pi$

¹ From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

² Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.

³ Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.

⁴ Using data from BARKOV 87, DOLINSKY 91, and ANTONELLI 92.

⁵ Using the data from ANTONELLI 92.

⁶ Using the data from IVANOV 81 and BISELLO 88B.

⁷ From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.

⁸ From a fit to two Breit-Wigner functions interfering between them and with the ω, ϕ tails with fixed (+, -, +) phases.

NODE=M006

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REFID=20435

REFID=20321

REFID=21291

REFID=20932

REFID=20304

REFID=20922

REFID=20924

REFID=20452

REFID

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
(180–250) OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
130 ± 50 ± 100		AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega \pi^+ \pi^- \gamma$
450 ± 70 ± 70		AUBERT,B	04N BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$
$870^{+500}_{-300} \pm 450$	1.2M	9 ACHASOV	03D RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
199 ± 15		10 HENNER	02 RVUE	$1.2-2.0 e^+ e^- \rightarrow \rho\pi, \omega\pi\pi$
188 ± 45	177	11 AKHMETSHIN	00D CMD2	$1.2-1.38 e^+ e^- \rightarrow \omega\pi^+ \pi^-$
360^{+100}_{-60}	5095	ANISOVICH	00H SPEC	$0.0 p\bar{p} \rightarrow \omega\pi^0 \pi^0 \pi^0$
240 ± 70		12 CLEGG	94 RVUE	
174 ± 59	315	13 ANTONELLI	92 DM2	$1.34-2.4 e^+ e^- \rightarrow \rho\pi$
9 From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega \pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.				
10 Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.				
11 Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.				
12 From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.				
13 From a fit to two Breit-Wigner functions interfering between them and with the ω, ϕ tails with fixed (+, -, +) phases.				

$\omega(1420)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \rho\pi$	dominant
$\Gamma_2 \omega\pi\pi$	seen
$\Gamma_3 b_1(1235)\pi$	seen
$\Gamma_4 e^+ e^-$	seen
$\Gamma_5 \pi^0 \gamma$	

$\omega(1420) \Gamma(i) \Gamma(e^+ e^-) / \Gamma^2(\text{total})$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.82 ± 0.05 ± 0.06		AUBERT,B	04N BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$
0.65 ± 0.13 ± 0.21	1.2M 14,15	ACHASOV	03D RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.625 ± 0.160		16,17 CLEGG	94 RVUE	
0.466 ± 0.178		18,19 ANTONELLI	92 DM2	$1.34-2.4 e^+ e^- \rightarrow \rho\pi$
14 Calculated by us from the cross section at the peak.				
15 From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega \pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.				
16 From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.				
17 From the partial and leptonic width given by the authors.				
18 From a fit to two Breit-Wigner functions interfering between them and with the ω, ϕ tails with fixed (+, -, +) phases.				
19 From the product of the leptonic width and partial branching ratio given by the authors.				

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
19.7 ± 5.7	AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega \pi^+ \pi^- \gamma$
1.9 ± 1.9	20 AKHMETSHIN	00D CMD2	$1.2-2.4 e^+ e^- \rightarrow \omega \pi^+ \pi^-$
20 Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.			

NODE=M125W
→ UNCHECKED ←

NODE=M125W;LINKAGE=VH

NODE=M125W;LINKAGE=AB

NODE=M125W;LINKAGE=KL

NODE=M125W;LINKAGE=AD

NODE=M125W;LINKAGE=B

NODE=M125215;NODE=M125

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=5;OUR EST;→ UNCHECKED ←
DESIG=3;OUR EST;→ UNCHECKED ←
DESIG=6

NODE=M125230

NODE=M125G3
NODE=M125G3

NODE=M125G;LINKAGE=AW
NODE=M125G;LINKAGE=VH

NODE=M125G;LINKAGE=AD

NODE=M125G;LINKAGE=SE
NODE=M125G;LINKAGE=A

NODE=M125G;LINKAGE=ES

NODE=M125G4
NODE=M125G4

NODE=M125G;LINKAGE=KL

$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_5/\Gamma \times \Gamma_4/\Gamma$		
<u>VALUE</u> (units 10^{-8})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
$2.03^{+0.70}_{-0.75}$	21 AKHMETSHIN 05	CMD2	$0.60\text{--}1.38 e^+e^- \rightarrow \pi^0\gamma$
21 Using 1420 MeV and 220 MeV for the $\omega(1420)$ mass and width.			

$\omega(1420)$ BRANCHING RATIOS			
$\Gamma(\omega\pi\pi)/\Gamma_{\text{total}}$	Γ_2/Γ		
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
0.301 ± 0.029 possibly seen	22 HENNER 02 AKHMETSHIN 00D	RVUE CMD2	$e^+e^- \rightarrow \rho\pi, \omega\pi\pi$ $e^+e^- \rightarrow \omega\pi^+\pi^-$

$\Gamma(\omega\pi\pi)/\Gamma(b_1(1235)\pi)$	Γ_2/Γ_3			
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
0.60 ± 0.16	5095	ANISOVICH 00H	SPEC	$0.0 p\bar{p} \rightarrow \omega\pi^0\pi^0\pi^0$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
0.699 ± 0.029	22 HENNER 02	RVUE	1.2–2.0	$e^+e^- \rightarrow \rho\pi, \omega\pi\pi$

$\Gamma(e^+e^-)/\Gamma_{\text{total}}$	Γ_4/Γ			
<u>VALUE</u> (units 10^{-7})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
~ 6.6	1.2M	23,24 ACHASOV 03D	RVUE	$0.44\text{--}2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
23 ± 1	22 HENNER 02	RVUE	1.2–2.0	$e^+e^- \rightarrow \rho\pi, \omega\pi\pi$

22 Assuming that the $\omega(1420)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.

23 Calculated by us from the cross section at the peak.

24 Assuming that the $\omega(1420)$ decays into $\rho\pi$ only.

$\omega(1420)$ REFERENCES			
AUBERT 07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)
AKHMETSHIN 05	PL B605 26	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AUBERT,B 04N	PR D70 072004	B. Aubert <i>et al.</i>	(BABAR Collab.)
ACHASOV 03D	PR D68 052006	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 02E	PR D66 032001	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
HENNER 02	EPJ C26 3	V.K. Henner <i>et al.</i>	
ACHASOV 01E	PR D63 072002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
AKHMETSHIN 00D	PL B489 125	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
ANISOVICH 00H	PL B485 341	A.V. Anisovich <i>et al.</i>	
ACHASOV 99E	PL B462 365	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 98H	PR D57 4334	N.N. Achasov, A.A. Kozhevnikov	
CLEGG 94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)
ANTONELLI 92	ZPHY C56 15	A. Antonelli <i>et al.</i>	(DM2 Collab.)
DOLINSKY 91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)
BISELLO 88B	ZPHY C39 13	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)
BARKOV 87	JETPL 46 164	L.M. Barkov <i>et al.</i>	(NOVO)
	Translated from ZETFP 46 132.		
CORDIER 81	PL 106B 155	A. Cordier <i>et al.</i>	(ORsay)
IVANOV 81	PL 107B 297	P.M. Ivanov <i>et al.</i>	(NOVO)

NODE=M125G5
NODE=M125G5

NODE=M125G5;LINKAGE=AK

NODE=M125225

NODE=M125R2
NODE=M125R2

NODE=M125R1
NODE=M125R1

NODE=M125R3
NODE=M125R3

NODE=M125R4
NODE=M125R4

NODE=M125R;LINKAGE=AC
NODE=M125R;LINKAGE=AW
NODE=M125R;LINKAGE=GS

NODE=M125

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REFID=47391
REFID=46323
REFID=44081
REFID=43168
REFID=41369
REFID=40581
REFID=40280
REFID=21586
REFID=20553

$f_2(1430)$ $I^G(J^{PC}) = 0^+(2^{++})$

OMITTED FROM SUMMARY TABLE

This entry lists nearby peaks observed in the D wave of the $K\bar{K}$ and $\pi^+\pi^-$ systems. Needs confirmation.

 $f_2(1430)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
≈ 1430 OUR ESTIMATE			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1453 ± 4	1 VLADIMIRSK...01	SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n$
1421 ± 5	AUGUSTIN 87	DM2	$J/\psi \rightarrow \gamma \pi^+ \pi^-$
1480 ± 50	AKESSON 86	SPEC	$p p \rightarrow p p \pi^+ \pi^-$
1436 $^{+26}_{-16}$	DAUM 84	CNTR	17–18 $\pi^- p \rightarrow K^+ K^- n$
1412 ± 3	DAUM 84	CNTR	63 $\pi^- p \rightarrow K_S^0 K_S^0 n, K^+ K^- n$
1439 $^{+5}_{-6}$	2 BEUSCH 67	OSPK	5,7,12 $\pi^- p \rightarrow K_S^0 K_S^0 n$
1 $J^{PC} = 0^{++}$ or 2^{++} .			
2 Not seen by WETZEL 76.			

NODE=M066

NODE=M066M1

NODE=M066M1
→ UNCHECKED ←

OCCUR=2

NODE=M066M;LINKAGE=AC
NODE=M066M;LINKAGE=C

NODE=M066W1

NODE=M066W1

OCCUR=2

NODE=M066W;LINKAGE=AC
NODE=M066W;LINKAGE=C

NODE=M066215;NODE=M066

DESIG=1

DESIG=2

NODE=M066

REFID=48571

REFID=40268

REFID=21123

REFID=21372

REFID=20362

REFID=20320

 $f_2(1430)$ DECAY MODES

Mode
$\Gamma_1 \quad K\bar{K}$
$\Gamma_2 \quad \pi\pi$

 $f_2(1430)$ REFERENCES

VLADIMIRSK... 01	PAN 64 1895	V.V. Vladmirsky <i>et al.</i>
	Translated from YAF 64 1979.	
AUGUSTIN 87	ZPHY C36 369	J.E. Augustin <i>et al.</i>
AKESSON 86	NP B264 154	T. Akesson <i>et al.</i>
DAUM 84	ZPHY C23 339	C. Daum <i>et al.</i>
WETZEL 76	NP B115 208	W. Wetzel <i>et al.</i>
BEUSCH 67	PL 25B 357	W. Beusch <i>et al.</i>

(LALO, CLER, FRAS+)
(Axial Field Spec. Collab.)
(AMST, CERN, CRAC, MPIM+) JP
(ETH, CERN, LOIC)
(ETH, CERN)

$a_0(1450)$ $I^G(J^{PC}) = 1^-(0^{++})$ See minireview on scalar mesons under $f_0(500)$.

NODE=M149

 $a_0(1450)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1474 ±19 OUR AVERAGE				
1480 ±30		ABELE 98	CBAR 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$	
1470 ±25		1 AMSLER 95D	CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1515 ±30		2 ANISOVICH 09	RVUE 0.0 $\bar{p}p$, πN	
1316.8 ±0.7 +24.7 1.0 -4.6		3 UEHARA 09A	BELL $\gamma\gamma \rightarrow \pi^0 \eta$	
1432 ±13 ±25		4 BUGG 08A	RVUE $\bar{p}p$	
1477 ±10	80k	5 UMAN 06	E835 5.2 $\bar{p}p \rightarrow \eta \eta \pi^0$	
1441 +40 -15	35280	2 BAKER 03	SPEC $\bar{p}p \rightarrow \omega \pi^+ \pi^- \pi^0$	
1303 ±16		6 BARGIOTTI 03	OBLX $\bar{p}p$	
1296 ±10		7 AMSLER 02	CBAR 0.9 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$	
1565 ±30		7 ANISOVICH 98B	RVUE Compilation	
1290 ±10		8 BERTIN 98B	OBLX 0.0 $\bar{p}p \rightarrow K^\pm K_S^\pm \pi^\mp$	
1450 ±40		AMSLER 94D	CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$	
1410 ±25		ETKIN 82C	MPS 23 $\pi^- p \rightarrow n2K_S^0$	
~1300		MARTIN 78	SPEC 10 $K^\pm p \rightarrow K_S^0 \pi p$	
1255 ±5		9 CASON 76		

1 Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

2 From the pole position.

3 May be a different state.

4 Using data from AMSLER 94D, ABELE 98, and BAKER 03. Supersedes BUGG 94.

5 Statistical error only.

6 Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^0 \pi^\mp$.

7 T-matrix pole.

8 Not confirmed by BUGG 08A.

9 Isospin 0 not excluded.

NODE=M149

NODE=M149M

NODE=M149M

NODE=M149M;LINKAGE=AB

NODE=M149M;LINKAGE=PP

NODE=M149M;LINKAGE=UE

NODE=M149M;LINKAGE=BU

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NODE=M149M;LINKAGE=BG

NODE=M149M;LINKAGE=AN

NODE=M149M;LINKAGE=BE

NODE=M149M;LINKAGE=CC

NODE=M149W

NODE=M149W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
265 ±13 OUR AVERAGE				
265 ±15		ABELE 98	CBAR 0.0 $\bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$	
265 ±30		10 AMSLER 95D	CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
230 ±36		11 ANISOVICH 09	RVUE 0.0 $\bar{p}p$, πN	
65.0 +2.1 +99.1 -5.4 -32.6		12 UEHARA 09A	BELL $\gamma\gamma \rightarrow \pi^0 \eta$	
196 ±10 ±10		13 BUGG 08A	RVUE $\bar{p}p$	
267 ±11	80k	14 UMAN 06	E835 5.2 $\bar{p}p \rightarrow \eta \eta \pi^0$	
110 ±14	35280	11 BAKER 03	SPEC $\bar{p}p \rightarrow \omega \pi^+ \pi^- \pi^0$	
92 ±16		15 BARGIOTTI 03	OBLX $\bar{p}p$	
81 ±21		16 AMSLER 02	CBAR 0.9 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$	
292 ±40		16 ANISOVICH 98B	RVUE Compilation	
80 ±5		17 BERTIN 98B	OBLX 0.0 $\bar{p}p \rightarrow K^\pm K_S^\pm \pi^\mp$	
270 ±40		AMSLER 94D	CBAR 0.0 $\bar{p}p \rightarrow \pi^0 \pi^0 \eta$	
230 ±30		ETKIN 82C	MPS 23 $\pi^- p \rightarrow n2K_S^0$	
~250		MARTIN 78	SPEC 10 $K^\pm p \rightarrow K_S^0 \pi p$	
79 ±10		18 CASON 76		

NODE=M149W

- 10 Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.
 11 From the pole position.
 12 May be a different state.
 13 Using data from AMSLER 94D, ABELE 98, and BAKER 03. Supersedes BUGG 94.
 14 Statistical error only.
 15 Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^0 \pi^\mp$.
 16 T-matrix pole.
 17 Not confirmed by BUGG 08A.
 18 Isospin 0 not excluded.

$a_0(1450)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\eta$	seen
$\Gamma_2 \pi\eta'(958)$	seen
$\Gamma_3 K\bar{K}$	seen
$\Gamma_4 \omega\pi\pi$	seen
$\Gamma_5 a_0(980)\pi\pi$	seen
$\Gamma_6 \gamma\gamma$	seen

$a_0(1450) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\pi\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_1\Gamma_6/\Gamma$
<u>VALUE</u> (eV)	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
$432 \pm 6^{+1073}_{-256}$	19 UEHARA 09A BELL $\gamma\gamma \rightarrow \pi^0\eta$
19 May be a different state.	

$a_0(1450)$ BRANCHING RATIOS

$\Gamma(\pi\eta'(958))/\Gamma(\pi\eta)$	Γ_2/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.35±0.16	
20 ABELE 98 CBAR	$0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
0.43±0.19	ABELE 97C CBAR $0.0 \bar{p}p \rightarrow \pi^0\pi^0\eta'$
20 Using $\pi^0\eta$ from AMSLER 94D.	

$\Gamma(K\bar{K})/\Gamma(\pi\eta)$	Γ_3/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.88±0.23	21 ABELE 98 CBAR $0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
21 Using $\pi^0\eta$ from AMSLER 94D.	

$\Gamma(\omega\pi\pi)/\Gamma(\pi\eta)$	Γ_4/Γ_1
<u>VALUE</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
10.7±2.3	35280 22 BAKER 03 SPEC $\bar{p}p \rightarrow \omega\pi^+\pi^-\pi^0$
22 Using results on $\bar{p}p \rightarrow a_0(1450)^0\pi^0$, $a_0(1450) \rightarrow \eta\pi^0$ from ABELE 96C and assuming the $\omega\rho$ mechanism for the $\omega\pi\pi$ state.	

$\Gamma(a_0(980)\pi\pi)/\Gamma_{\text{total}}$	Γ_5/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
seen	BUGG 08A RVUE $\bar{p}p$

$\Gamma(a_0(980)\pi\pi)/\Gamma(\pi\eta)$	Γ_5/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
≤ 4.3	ANISOVICH 01 RVUE 0 $\bar{p}p \rightarrow \eta 2\pi^+ 2\pi^-$

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	Γ_6/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
seen	23 UEHARA 09A BELL $\gamma\gamma \rightarrow \pi^0\eta$
23 May be a different state.	

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 NODE=M149W;LINKAGE=UE
 NODE=M149W;LINKAGE=BU
 NODE=M149W;LINKAGE=ST
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 NODE=M149W;LINKAGE=BE
 NODE=M149W;LINKAGE=CC

NODE=M149215;NODE=M149

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 DESIG=4;OUR EST; \rightarrow UNCHECKED \leftarrow
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 DESIG=6

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 NODE=M149R01

NODE=M149R02
 NODE=M149R02

NODE=M149R03
 NODE=M149R03

NODE=M149R03;LINKAGE=UE

$a_0(1450)$ REFERENCES

ANISOVICH UEHARA BUGG UMAN BAKER BARGIOTTI AMSLER ANISOVICH ABELE ANISOVICH	09 09A 08A 06 03 03 02 01 98 98B	IJMP A24 2481 PR D80 032001 PR D78 074023 PR D73 052009 PL B563 140 EPJ C26 371 EPJ C23 29 NP A690 567 PR D57 3860 SPU 41 419	V.V. Anisovich, A.V. Sarantsev S. Uehara <i>et al.</i> D.V. Bugg I. Uman <i>et al.</i> C.A. Baker <i>et al.</i> M. Bargiotti <i>et al.</i> C. Amsler <i>et al.</i> A.V. Anisovich <i>et al.</i> A. Abele <i>et al.</i> V.V. Anisovich <i>et al.</i>	(BELLE Collab.) (LOQM) (FNAL E835) (OBELIX Collab.) (Crystal Barrel Collab.)
BERTIN ABELE ABELE 96C 95B 95C 95D 94D BUGG 94 ETKIN 82C MARTIN 78 CASON	98B 97C 97C 96C 95B 95C 95D 94D 94 82C 82C 82C 78 76	Translated from UFN 168 481. PL B434 180 PL B404 179 NP A609 562 PL B342 433 PL B353 571 PL B355 425 PL B333 277 PR D50 4412 PR D25 2446 NP B134 392 PRL 36 1485	A. Bertin <i>et al.</i> A. Abele <i>et al.</i> A. Abele <i>et al.</i> C. Amsler <i>et al.</i> C. Amsler <i>et al.</i> C. Amsler <i>et al.</i> C. Amsler <i>et al.</i> D.V. Bugg <i>et al.</i> A. Etkin <i>et al.</i> A.D. Martin <i>et al.</i> N.M. Cason <i>et al.</i>	(OBELIX Collab.) (Crystal Barrel Collab.) (Crystal Barrel Collab.) (Crystal Barrel Collab.) (Crystal Barrel Collab.) (Crystal Barrel Collab.) (Crystal Barrel Collab.) (LOQM) (BNL, CUNY, TUFTS, VAND) (DURH, GEVA) (NDAM, ANL)

 $\rho(1450)$

$$I^G(J^{PC}) = 1^+(1^{--})$$

See our mini-review under the $\rho(1700)$. **$\rho(1450)$ MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1465 ± 25 OUR ESTIMATE			This is only an educated guess; the error given is larger than the error on the average of the published values.

 $\eta\rho^0$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1497 \pm 14	¹ AKHMETSHIN 01B	CMD2	$e^+ e^- \rightarrow \eta\gamma$
1421 \pm 15	² AKHMETSHIN 00D	CMD2	$e^+ e^- \rightarrow \eta\pi^+\pi^-$
1470 \pm 20	ANTONELLI 88	DM2	$e^+ e^- \rightarrow \eta\pi^+\pi^-$
1446 \pm 10	FUKUI 88	SPEC	$8.95\pi^- p \rightarrow \eta\pi^+\pi^- n$
1 Using the data of AKHMETSHIN 01B on $e^+ e^- \rightarrow \eta\gamma$, AKHMETSHIN 00D and ANTONELLI 88 on $e^+ e^- \rightarrow \eta\pi^+\pi^-$. 2 Using the data of ANTONELLI 88, DOLINSKY 91, and AKHMETSHIN 00D. The energy-independent width of the $\rho(1450)$ and $\rho(1700)$ mesons assumed.			

 $\omega\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1582 \pm 17 \pm 25	2382	³ AKHMETSHIN 03B	CMD2	$e^+ e^- \rightarrow \pi^0\pi^0\gamma$
1349 ± 25 $+10$ -5	341	⁴ ALEXANDER 01B	CLE2	$B \rightarrow D^{(*)}\omega\pi^-$
1523 \pm 10		⁵ EDWARDS 00A	CLE2	$\tau^- \rightarrow \omega\pi^-\nu_\tau$
1463 \pm 25		⁶ CLEGG 94	RVUE	
1250		⁷ ASTON 80C	OMEG	$20-70\gamma p \rightarrow \omega\pi^0 p$
1290 \pm 40		⁷ BARBER 80C	SPEC	$3-5\gamma p \rightarrow \omega\pi^0 p$
3 Using the data of AKHMETSHIN 03B and BISELLO 91B assuming the $\omega\pi^0$ and $\pi^+\pi^-$ mass dependence of the total width. $\rho(1700)$ mass and width fixed at 1700 MeV and 240 MeV, respectively. 4 Using Breit-Wigner parameterization of the $\rho(1450)$ and assuming the $\omega\pi^-$ mass dependence for the total width. 5 Mass-independent width parameterization. $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively. 6 Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L. 7 Not separated from $b_1(1235)$, not pure $J^P = 1^-$ effect.				

 4π MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1435 \pm 40	ABELE 01B	CBAR	$0.0\bar{p}n \rightarrow 2\pi^-2\pi^0\pi^+$
1350 \pm 50	ACHASOV 97	RVUE	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
1449 \pm 4	⁸ ARMSTRONG 89E	OMEG	$300pp \rightarrow pp2(\pi^+\pi^-)$
8 Not clear whether this observation has $I=1$ or 0.			

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REFID=44093
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REFID=21064

NODE=M105

NODE=M105

NODE=M105205

NODE=M105M0
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NODE=M105M1
NODE=M105M1

NODE=M105M;LINKAGE=SW

NODE=M105M1;LINKAGE=KL

NODE=M105M3
NODE=M105M3

NODE=M105M3;LINKAGE=HK

NODE=M105M3;LINKAGE=3Z

NODE=M105M;LINKAGE=E1

NODE=M105M3;LINKAGE=B

NODE=M105M3;LINKAGE=A

NODE=M105M6
NODE=M105M6

NODE=M105M6;LINKAGE=A

$\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1350 ± 20	$^{+20}_{-30}$ 63.5k	9 ABRAMOWICZ12	ZEUS	$e p \rightarrow e \pi^+ \pi^- p$	
1493 ± 15		10 LEES	12G BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$	
1446 ± 7	± 28 5.4M	11,12 FUJIKAWA	08 BELL	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
1328 ± 15		13 SCHAEEL	05C ALEP	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
1406 ± 15	87k	11,14 ANDERSON	00A CLE2	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$	
~ 1368		15 ABELE	99C CBAR	$0.0 \bar{p}d \rightarrow \pi^+ \pi^- \pi^- p$	
1348 ± 33		BERTIN	98 OBLX	$0.05-0.405 \bar{n}p \rightarrow 2\pi^+ \pi^-$	
1411 ± 14		16 ABELE	97 CBAR	$\bar{p}n \rightarrow \pi^- \pi^0 \pi^0$	
1370 ± 90	± 70	ACHASOV	97 RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	
1359 ± 40		14 BERTIN	97C OBLX	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$	
1282 ± 37		BERTIN	97D OBLX	$0.05 \bar{p}p \rightarrow 2\pi^+ 2\pi^-$	
1424 ± 25		BISELLLO	89 DM2	$e^+ e^- \rightarrow \pi^+ \pi^-$	
1265.5 ± 75.3		DUBNICKA	89 RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$	
1292 ± 17		17 KURDADZE	83 OLYA	$0.64-1.4 e^+ e^- \rightarrow \pi^+ \pi^-$	
9 Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho-\omega$ interference.					
10 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.					
11 From the GOUNARIS 68 parametrization of the pion form factor.					
12 $ F_\pi(0) ^2$ fixed to 1.					
13 From the combined fit of the τ^- data from ANDERSON 00A and SCHAEEL 05C and $e^+ e^-$ data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. $\rho(1700)$ mass and width fixed at 1713 MeV and 235 MeV, respectively. Supersedes BARATE 97M.					
14 $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV, respectively.					
15 $\rho(1700)$ mass and width fixed at 1780 MeV and 275 MeV respectively.					
16 T-matrix pole.					
17 Using for $\rho(1700)$ mass and width 1600 ± 20 and 300 ± 10 MeV respectively.					

NODE=M105M5

NODE=M105M5

 $K\bar{K}$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1422.8 ± 6.5	27k	18 ABELE	99D CBAR	\pm	$0.0 \bar{p}p \rightarrow K^+ K^- \pi^0$
18 K-matrix pole. Isospin not determined, could be $\omega(1420)$.					

NODE=M105M5;LINKAGE=AB

NODE=M105M5;LINKAGE=LE

NODE=M105M;LINKAGE=1K

NODE=M105M5;LINKAGE=FU

NODE=M105M5;LINKAGE=SC

 $K\bar{K}^*(892) + c.c.$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1505 $\pm 19 \pm 7$	AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow K\bar{K}^*(892)\gamma$

NODE=M105M7

NODE=M105M7

NODE=M105M7;LINKAGE=AN

NODE=M105M8

NODE=M105M8

NODE=M105210

NODE=M105W0

→ UNCHECKED ←

NODE=M105W1

NODE=M105W1

400 \pm 60 OUR ESTIMATE This is only an educated guess; the error given is larger than the error on the average of the published values. **$\eta\rho^0$ MODE**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			

• • • We do not use the following data for averages, fits, limits, etc. • • •

226 ± 44	19 AKHMETSHIN 01B	CMD2	$e^+ e^- \rightarrow \eta\gamma$
211 ± 31	20 AKHMETSHIN 00D	CMD2	$e^+ e^- \rightarrow \eta\pi^+ \pi^-$
230 ± 30	ANTONELLI 88	DM2	$e^+ e^- \rightarrow \eta\pi^+ \pi^-$
60 ± 15	FUKUI	88 SPEC	$8.95 \pi^- p \rightarrow \eta\pi^+ \pi^- n$
19 Using the data of AKHMETSHIN 01B on $e^+ e^- \rightarrow \eta\gamma$, AKHMETSHIN 00D and ANTONELLI 88 on $e^+ e^- \rightarrow \eta\pi^+ \pi^-$.			
20 Using the data of ANTONELLI 88, DOLINSKY 91, and AKHMETSHIN 00D. The energy-independent width of the $\rho(1450)$ and $\rho(1700)$ mesons assumed.			

NODE=M105W;LINKAGE=SW

NODE=M105W1;LINKAGE=KL

$\omega\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
429 ± 42 ± 10	2382	21 AKHMETSHIN 03B	CMD2	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
547 ± 86 ± 46	341	22 ALEXANDER 01B	CLE2	$B \rightarrow D(*) \omega \pi^-$
400 ± 35		23 EDWARDS 00A	CLE2	$\tau^- \rightarrow \omega \pi^- \nu_\tau$
311 ± 62		24 CLEGG 94	RVUE	
300		25 ASTON 80C	OMEG	$20-70 \gamma p \rightarrow \omega \pi^0 p$
320 ± 100		25 BARBER 80C	SPEC	$3-5 \gamma p \rightarrow \omega \pi^0 p$
21 Using the data of AKHMETSHIN 03B and BISELLO 91B assuming the $\omega \pi^0$ and $\pi^+ \pi^-$ mass dependence of the total width. $\rho(1700)$ mass and width fixed at 1700 MeV and 240 MeV, respectively.				
22 Using Breit-Wigner parameterization of the $\rho(1450)$ and assuming the $\omega \pi^-$ mass dependence for the total width.				
23 Mass-independent width parameterization. $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively.				
24 Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.				
25 Not separated from $b_1(1235)$, not pure $J^P = 1^-$ effect.				

NODE=M105W3

NODE=M105W3

 4π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
325 ± 100		ABELE 01B	CBAR	$0.0 \bar{p}n \rightarrow 2\pi^- 2\pi^+$

NODE=M105W3;LINKAGE=HK

NODE=M105W3;LINKAGE=3Z

NODE=M105W;LINKAGE=E1

NODE=M105W3;LINKAGE=B

NODE=M105W3;LINKAGE=A

NODE=M105W66

NODE=M105W66

 $\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

460 ± 30 ± 40 -45	63.5k	26 ABRAMOWICZ12	ZEUS	$e p \rightarrow e \pi^+ \pi^- p$
427 ± 31		27 LEES	12G BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
434 ± 16 ± 60	5.4M	28,29 FUJIKAWA	08 BELL	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$
468 ± 41		30 SCHAEL	05C ALEP	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$
455 ± 41	87k	28,31 ANDERSON	00A CLE2	$\tau^- \rightarrow \pi^- \pi^0 \nu_\tau$
~ 374		32 ABELE	99C CBAR	$0.0 \bar{p}d \rightarrow \pi^+ \pi^- \pi^- p$
275 ± 10		BERTIN	98 OBLX	$0.05-0.405 \bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$
343 ± 20		33 ABELE	97 CBAR	$\bar{p}n \rightarrow \pi^- \pi^0 \pi^0$
310 ± 40		31 BERTIN	97C OBLX	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$
236 ± 36		BERTIN	97D OBLX	$0.05 \bar{p}p \rightarrow 2\pi^+ 2\pi^-$
269 ± 31		BISELLO	89 DM2	$e^+ e^- \rightarrow \pi^+ \pi^-$
391 ± 70		DUBNICKA	89 RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$
218 ± 46		34 KURDADZE	83 OLYA	$0.64-1.4 e^+ e^- \rightarrow \pi^+ \pi^-$

NODE=M105W5

NODE=M105W5

26 Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho-\omega$ interference.				
27 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.				
28 From the GOUNARIS 68 parametrization of the pion form factor.				
29 $ F_\pi(0) ^2$ fixed to 1.				
30 From the combined fit of the τ^- data from ANDERSON 00A and SCHAEL 05C and $e^+ e^-$ data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. $\rho(1700)$ mass and width fixed at 1713 MeV and 235 MeV, respectively. Supersedes BARATE 97M.				
31 $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV, respectively.				
32 $\rho(1700)$ mass and width fixed at 1780 MeV and 275 MeV respectively.				
33 T-matrix pole.				
34 Using for $\rho(1700)$ mass and width 1600 ± 20 and 300 ± 10 MeV respectively.				

NODE=M105W5;LINKAGE=AB

NODE=M105W5;LINKAGE=LE

NODE=M105W;LINKAGE=1K

NODE=M105W5;LINKAGE=FU

NODE=M105W5;LINKAGE=SC

NODE=M105W5;LINKAGE=A

NODE=M105W5;LINKAGE=C5

NODE=M105W5;LINKAGE=QQ

NODE=M105W5;LINKAGE=KD

NODE=M105W7

NODE=M105W7

NODE=M105W7;LINKAGE=AN

NODE=M105W8

NODE=M105W8

• • • We do not use the following data for averages, fits, limits, etc. • • •

146.5 ± 10.5 27k 35 ABELE 99D CBAR ± 0.0 $\bar{p}p \rightarrow K^+ K^- \pi^0$ 35 K-matrix pole. Isospin not determined, could be $\omega(1420)$. **$K\bar{K}$ MODE**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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NODE=M105W7;LINKAGE=AN

• • • We do not use the following data for averages, fits, limits, etc. • • •

418 ± 25 ± 4 AUBERT 08S BABR 10.6 $e^+ e^- \rightarrow K\bar{K}^*(892)\gamma$

$\rho(1450)$ DECAY MODES

NODE=M105215;NODE=M105

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	seen
$\Gamma_2 4\pi$	seen
$\Gamma_3 \omega\pi$	
$\Gamma_4 a_1(1260)\pi$	
$\Gamma_5 h_1(1170)\pi$	
$\Gamma_6 \pi(1300)\pi$	
$\Gamma_7 \rho\rho$	
$\Gamma_8 \rho(\pi\pi)_{S\text{-wave}}$	
$\Gamma_9 e^+e^-$	seen
$\Gamma_{10} \eta\rho$	possibly seen
$\Gamma_{11} a_2(1320)\pi$	not seen
$\Gamma_{12} K\bar{K}$	not seen
$\Gamma_{13} K\bar{K}^*(892)+\text{c.c.}$	possibly seen
$\Gamma_{14} \eta\gamma$	possibly seen
$\Gamma_{15} f_0(500)\gamma$	not seen
$\Gamma_{16} f_0(980)\gamma$	not seen
$\Gamma_{17} f_0(1370)\gamma$	not seen
$\Gamma_{18} f_2(1270)\gamma$	not seen

 $\rho(1450) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\pi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_1\Gamma_9/\Gamma$		
VALUE (keV)	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.12	³⁶ DIEKMAN 88	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
$0.027^{+0.015}_{-0.010}$	³⁷ KURDADZE 83	OLYA	$0.64-1.4 e^+e^- \rightarrow \pi^+\pi^-$

$\Gamma(\eta\rho) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{10}\Gamma_9/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

74±20	³⁸ AKHMETSHIN 00D	CMD2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
91±19	ANTONELLI 88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$

$\Gamma(\eta\gamma) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{14}\Gamma_9/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

<16.4	³⁹ AKHMETSHIN 05	CMD2	$0.60-1.38 e^+e^- \rightarrow \eta\gamma$
$2.2 \pm 0.5 \pm 0.3$	⁴⁰ AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$

$\Gamma(K\bar{K}^*(892)+\text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{13}\Gamma_9/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

127±15±6	AUBERT 08S	BABR	$10.6 e^+e^- \rightarrow K\bar{K}^*(892)\gamma$
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36 Using total width = 235 MeV.

37 Using for $\rho(1700)$ mass and width 1600 ± 20 and 300 ± 10 MeV respectively.38 Using the data of ANTONELLI 88, DOLINSKY 91, and AKHMETSHIN 00D. The energy-independent width of the $\rho(1450)$ and $\rho(1700)$ mesons assumed.39 From 2γ decay mode of η using 1465 MeV and 310 MeV for the $\rho(1450)$ mass and width. Recalculated by us.40 Using the data of AKHMETSHIN 01B on $e^+e^- \rightarrow \eta\gamma$, AKHMETSHIN 00D and ANTONELLI 88 on $e^+e^- \rightarrow \eta\pi^+\pi^-$. Recalculated by us using width of 226 MeV. **$\rho(1450) \Gamma(i)/\Gamma(\text{total}) \times \Gamma(e^+e^-)/\Gamma(\text{total})$**

$\Gamma(f_0(500)\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{15}/\Gamma \times \Gamma_9/\Gamma$			
VALUE (units 10^{-9})	CL%	DOCUMENT ID	TECN	COMMENT
<4.0	90	ACHASOV	11	SND $e^+e^- \rightarrow \pi^0\pi^0\gamma$

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NODE=M105215;NODE=M105

DESIG=1;OUR EST; \rightarrow UNCHECKED ←
 DESIG=2;OUR EST; \rightarrow UNCHECKED ←
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 DESIG=8;OUR EST; \rightarrow UNCHECKED ←
 DESIG=7;OUR EVAL; \rightarrow UNCHECKED ←
 DESIG=15;OUR EST; \rightarrow UNCHECKED ←
 DESIG=9;OUR EST; \rightarrow UNCHECKED ←
 DESIG=16;OUR EST; \rightarrow UNCHECKED ←
 DESIG=17;OUR EST; \rightarrow UNCHECKED ←
 DESIG=18;OUR EST; \rightarrow UNCHECKED ←
 DESIG=19;OUR EST; \rightarrow UNCHECKED ←

NODE=M105220

NODE=M105G3
NODE=M105G3NODE=M105G4
NODE=M105G4NODE=M105G6
NODE=M105G6NODE=M105G3;LINKAGE=B
NODE=M105G3;LINKAGE=KD
NODE=M105G4;LINKAGE=KL

NODE=M105G6;LINKAGE=AK

NODE=M105G;LINKAGE=SW

NODE=M105230

NODE=M105R01
NODE=M105R01

$\Gamma(f_0(980)\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$				$\Gamma_{16}/\Gamma \times \Gamma_9/\Gamma$		NODE=M105R02 NODE=M105R02
<u>VALUE</u> (units 10^{-9})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<2.6	90	ACHASOV	11	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$	
$\Gamma(f_0(1370)\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$				$\Gamma_{17}/\Gamma \times \Gamma_9/\Gamma$		NODE=M105R03 NODE=M105R03
<u>VALUE</u> (units 10^{-9})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<3.5	90	ACHASOV	11	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$	
$\Gamma(f_2(1270)\gamma)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$				$\Gamma_{18}/\Gamma \times \Gamma_9/\Gamma$		NODE=M105R04 NODE=M105R04
<u>VALUE</u> (units 10^{-9})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<0.8	90	41 ACHASOV	11	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$	
41 Using Breit-Wigner parametrization of the $\rho(1450)$ with mass and width of 1465 MeV and 400 MeV, respectively.						

$\rho(1450)$ BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma(4\pi)$				Γ_1/Γ_2		NODE=M105225
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.37±0.10	42,43 ABELE	01B CBAR	0.0 $\bar{p}n \rightarrow 5\pi$			
$\Gamma(\omega\pi)/\Gamma_{\text{total}}$				Γ_3/Γ		NODE=M105R5 NODE=M105R5
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
seen ~0.21	1.6k CLEGG	ACHASOV 94	SND RVUE	$e^+e^- \rightarrow \pi^0\pi^0\gamma$		
$\Gamma(\pi\pi)/\Gamma(\omega\pi)$				Γ_1/Γ_3		NODE=M105R6 NODE=M105R6
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>				
• • • We do not use the following data for averages, fits, limits, etc. • • •						
~0.32	CLEGG	94	RVUE			
$\Gamma(\omega\pi)/\Gamma(4\pi)$				Γ_3/Γ_2		NODE=M105R3 NODE=M105R3
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>				
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.14	CLEGG	88	RVUE			
$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$				Γ_4/Γ_2		NODE=M105R10 NODE=M105R10
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.27±0.08	42 ABELE	01B CBAR	0.0 $\bar{p}n \rightarrow 5\pi$			
$\Gamma(h_1(1170)\pi)/\Gamma(4\pi)$				Γ_5/Γ_2		NODE=M105R11 NODE=M105R11
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.08±0.04	42 ABELE	01B CBAR	0.0 $\bar{p}n \rightarrow 5\pi$			
$\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$				Γ_6/Γ_2		NODE=M105R12 NODE=M105R12
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.37±0.13	42 ABELE	01B CBAR	0.0 $\bar{p}n \rightarrow 5\pi$			
$\Gamma(\rho\rho)/\Gamma(4\pi)$				Γ_7/Γ_2		NODE=M105R13 NODE=M105R13
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.11±0.05	42 ABELE	01B CBAR	0.0 $\bar{p}n \rightarrow 5\pi$			
$\Gamma(\rho(\pi\pi)s\text{-wave})/\Gamma(4\pi)$				Γ_8/Γ_2		NODE=M105R14 NODE=M105R14
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.17±0.09	42 ABELE	01B CBAR	0.0 $\bar{p}n \rightarrow 5\pi$			

$\Gamma(\eta\rho)/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECN Γ_{10}/Γ

NODE=M105R2

NODE=M105R2

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.04

DONNACHIE 87B RVUE

 $\Gamma(\eta\rho)/\Gamma(\omega\pi)$ VALUEDOCUMENT IDTECNCOMMENT Γ_{10}/Γ_3

NODE=M105R4

NODE=M105R4

• • • We do not use the following data for averages, fits, limits, etc. • • •

\sim 0.24

44 DONNACHIE 91 RVUE

>2

FUKUI 91 SPEC $8.95 \pi^- p \rightarrow \omega\pi^0 n$ $\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENT Γ_{11}/Γ

NODE=M105R9

NODE=M105R9

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen

AMELIN 00 VES

37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$ $\Gamma(K\bar{K})/\Gamma(\omega\pi)$ VALUEDOCUMENT IDTECN Γ_{12}/Γ_3

NODE=M105R8

NODE=M105R8

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.08

44 DONNACHIE 91 RVUE

 $\Gamma(K\bar{K}^*(892)+c.c.)/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENT Γ_{13}/Γ

NODE=M105R16

NODE=M105R16

• • • We do not use the following data for averages, fits, limits, etc. • • •

possibly seen

COAN 04 CLEO

 $\tau^- \rightarrow K^-\pi^-K^+\nu_\tau$ 42 $\omega\pi$ not included.

43 Using ABELE 97.

44 Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.

 $\rho(1450)$ REFERENCES

ABRAMOWICZ 12	EPJ C72 1869	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
ACHASOV 12	JETPL 94 734	M.N. Achasov <i>et al.</i>	
	Translated from ZETFP 94 796.		
LEES 12G	PR D86 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ACHASOV 11	JETP 113 75	M.N. Achasov <i>et al.</i>	(SND Collab.)
	Translated from ZETFP 140 87.		
AUBERT 08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
FUJIKAWA 08	PR D78 072006	M. Fujikawa <i>et al.</i>	(BELLE Collab.)
AKHMETSHIN 05	PL B605 26	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
ALOISIO 05	PL B606 12	A. Aloisio <i>et al.</i>	(KLOE Collab.)
SCHAEL 05C	PRPL 421 191	S. Schael <i>et al.</i>	(ALEPH Collab.)
AKHMETSHIN 04	PL B578 285	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
COAN 04	PR D92 232001	T.E. Coan <i>et al.</i>	(CLEO Collab.)
AKHMETSHIN 03B	PL B562 173	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
ABELE 01B	EPJ C21 261	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
AKHMETSHIN 01B	PL B509 217	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
ALEXANDER 01B	PR D64 092001	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
AKHMETSHIN 00D	PL B489 125	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AMELIN 00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)
ANDERSON 00A	PR D61 112002	S. Anderson <i>et al.</i>	(CLEO Collab.)
EDWARDS 00A	PR D61 072003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
ABELE 99C	PL B450 275	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ABELE 99D	PL B468 178	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
BERTIN 98	PR D57 55	A. Bertin <i>et al.</i>	(OBELIX Collab.)
ABELE 97	PL B391 191	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ACHASOV 97	PR D55 2663	N.N. Achasov <i>et al.</i>	(NOVM)
BARATE 97M	ZPHY C76 15	R. Barate <i>et al.</i>	(ALEPH Collab.)
BERTIN 97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)
BERTIN 97D	PL B414 220	A. Bertin <i>et al.</i>	(OBELIX Collab.)
CLEGG 94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)
BISELLO 91B	NPBPS B21 111	D. Bisello	(DM2 Collab.)
DOLINSKY 91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)
DONNACHIE 91	ZPHY C51 689	A. Donnachie, A.B. Clegg	(MCHS, LANC)
FUKUI 91	PL B257 241	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)
KUHN 90	ZPHY C48 445	J.H. Kuhn <i>et al.</i>	(MPIM)
ARMSTRONG 89E	PL B228 536	T.A. Armstrong, M. Benayoun	(ATHU, BARI, BIRMP+)
BISELLO 89	PL B220 321	D. Bisello <i>et al.</i>	(DM2 Collab.)
DUBNICKA 89	JPG 15 1349	S. Dubnicka <i>et al.</i>	(JINR, SLOV)
ANTONELLI 88	PL B212 133	A. Antonelli <i>et al.</i>	(DM2 Collab.)
CLEGG 88	ZPHY C40 313	A.B. Clegg, A. Donnachie	(MCHS, LANC)
DIEMAN 88	PRPL 159 99	B. Diekmann	(BONN)
FUKUI 88	PL B202 441	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)
ALBRECHT 87L	PL B185 223	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
DONNACHIE 87B	ZPHY C34 257	A. Donnachie, A.B. Clegg	(MCHS, LANC)
DOLINSKY 86	PL B174 453	S.I. Dolinsky <i>et al.</i>	(NOVO)
BARKOV 85	NP B256 365	L.M. Barkov <i>et al.</i>	(NOVO)
KURDADZIE 83	JETPL 37 733	L.M. Kurdadze <i>et al.</i>	(NOVO)
	Translated from ZETFP 37 613.		
ASTON 80C	PL 92B 211	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)
BARBER 80C	ZPHY C4 169	D.P. Barber <i>et al.</i>	(DARE, LANC, SHEF)
GOUNARIS 68	PRL 21 244	G.J. Gounaris, J.J. Sakurai	

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REFID=20653

REFID=48054

$\eta(1475)$

$I^G(J^{PC}) = 0^+(0^-+)$

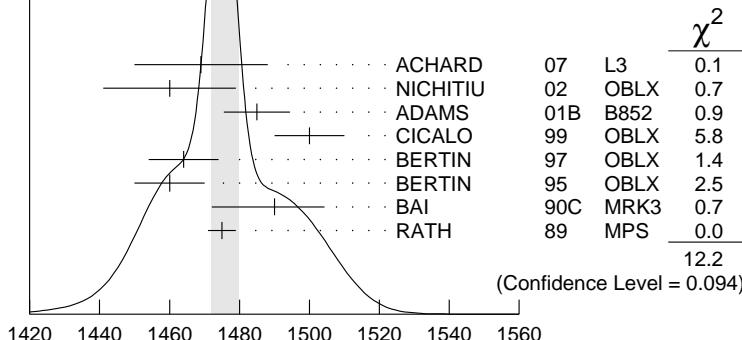
See also the $\eta(1405)$.

$\eta(1475)$ MASS

$K\bar{K}\pi$ MODE ($K^*(892)$) K dominant)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1476± 4 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
1469±14±13	74	ACHARD	07 L3	$183-209 e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$
1460±19	3651	NICHITIU	02 OBLX	
1485± 8± 5	20k	ADAMS	01B B852	$18 \text{ GeV } \pi^- p \rightarrow K^+ K^- \pi^0 n$
1500±10		CICALO	99 OBLX	$0 \bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp \pi^+ \pi^-$
1464±10		BERTIN	97 OBLX	$0 \bar{p}p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
1460±10		BERTIN	95 OBLX	$0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$
$1490^{+14+ 3}_{-8-16}$	1100	BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
1475± 4		RATH	89 MPS	$21.4 \pi^- p \rightarrow n K_S^0 K_S^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1421±14		AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$

WEIGHTED AVERAGE
1476±4 (Error scaled by 1.3)



$\eta(1475)$ mass, $K\bar{K}\pi$ mode ($K^*(892)$) K dominant) (MeV)

$\eta(1475)$ WIDTH

$K\bar{K}\pi$ MODE ($K^*(892)$) K dominant)

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
85± 9 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.				
67±18± 7	74	ACHARD	07 L3	$183-209 e^+e^- \rightarrow e^+e^- K_S^0 K^\pm \pi^\mp$
120±19	3651	NICHITIU	02 OBLX	
98±18± 3	20k	ADAMS	01B B852	$18 \text{ GeV } \pi^- p \rightarrow K^+ K^- \pi^0 n$
100±20		CICALO	99 OBLX	$0 \bar{p}p \rightarrow K^\pm K_S^0 \pi^\mp \pi^+ \pi^-$
105±15		BERTIN	97 OBLX	$0 \bar{p}p \rightarrow K^\pm (K^0) \pi^\mp \pi^+ \pi^-$
105±15		BERTIN	95 OBLX	$0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$
63±18		AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$
$54^{+37+ 13}_{-21-24}$		BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
51±13		RATH	89 MPS	$21.4 \pi^- p \rightarrow n K_S^0 K_S^0 \pi^0$

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NODE=M175205

NODE=M175M5
NODE=M175M5

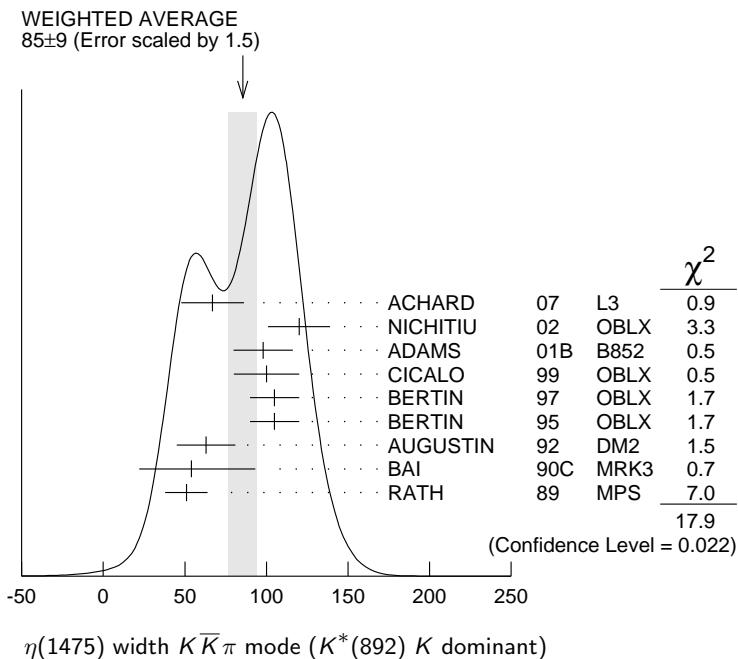
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OCCUR=2

NODE=M175210

NODE=M175W5
NODE=M175W5

OCCUR=2
OCCUR=2
OCCUR=2



$\eta(1475)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\bar{K}\pi$	dominant
$\Gamma_2 K\bar{K}^*(892) + \text{c.c.}$	seen
$\Gamma_3 a_0(980)\pi$	seen
$\Gamma_4 \gamma\gamma$	seen

$\eta(1475) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_1\Gamma_4/\Gamma$				
VALUE (keV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$0.23 \pm 0.05 \pm 0.05$	74	1	ACHARD	07	$L3$ $183-209 e^+ e^- \rightarrow e^+ e^- K_S^0 K^\pm \pi^\mp$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 0.089 90 2,3 AHOHE 05 CLE2 $10.6 e^+ e^- \rightarrow e^+ e^- K_S^0 K^\pm \pi^\mp$

¹ Supersedes ACCIARRI 01G. Compatible with $K^* K$ decay. Using $B(K_S^0 \rightarrow \pi^+ \pi^-) = 0.6895$.

² Using $\eta(1475)$ mass of 1481 MeV and width of 48 MeV. The upper limit increases to 0.140 keV if the world average value, 87 MeV, of the width is used.

³ Assuming three-body phase-space decay to $K_S^0 K^\pm \pi^\mp$.

$\eta(1475)$ BRANCHING RATIOS

$\Gamma(K\bar{K}^*(892) + \text{c.c.})/\Gamma(K\bar{K}\pi)$	Γ_2/Γ_1			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

0.50 ± 0.10 4 BAILLON 67 HBC $0.0 \bar{p}p \rightarrow K\bar{K}\pi\pi\pi$

$\Gamma(K\bar{K}^*(892) + \text{c.c.})/[\Gamma(K\bar{K}^*(892) + \text{c.c.}) + \Gamma(a_0(980)\pi)]$	$\Gamma_2/(\Gamma_2 + \Gamma_3)$			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

< 0.25 90 EDWARDS 82E CBAL $J/\psi \rightarrow K^+ K^- \pi^0 \gamma$

⁴ Data could also refer to $\eta(1405)$.

NODE=M175215;NODE=M175

DESIG=2;OUR EST;→ UNCHECKED ←
DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=7;OUR EST;→ UNCHECKED ←

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NODE=M175G2
NODE=M175G2

NODE=M175G2;LINKAGE=CH

NODE=M175G2;LINKAGE=AH

NODE=M175G2;LINKAGE=B3

NODE=M175225

NODE=M175R1
NODE=M175R1

NODE=M175R6
NODE=M175R6

NODE=M175R;LINKAGE=BL

$\eta(1475)$ REFERENCES

ACHARD	07	JHEP 0703 018	P. Achard <i>et al.</i>	(L3 Collab.)	REFID=51698
AHOHE	05	PR D71 072001	R. Ahote <i>et al.</i>	(CLEO Collab.)	REFID=50764
NICHITIU	02	PL B545 261	F. Nichitiu <i>et al.</i>	(OBELIX Collab.)	REFID=48848
ACCIARRI	01G	PL B501 1	M. Acciari <i>et al.</i>	(L3 Collab.)	REFID=48319
ADAMS	01B	PL B516 264	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)	REFID=49649
CICALO	99	PL B462 453	C. Cicalo <i>et al.</i>	(OBELIX Collab.)	REFID=47394
BERTIN	97	PL B400 226	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=45417
BERTIN	95	PL B361 187	A. Bertin <i>et al.</i>	(OBELIX Collab.)	REFID=44614
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41584
BAI	90C	PRL 65 2507	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41578
RATH	89	PR D40 693	M.G. Rath <i>et al.</i>	(NDAM, BRAN, BNL, CUNY+)	REFID=40924
EDWARDS	82E	PRL 49 259	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21314
BAILLON	67	NC 50A 393	P.H. Baillon <i>et al.</i>	(CERN, CDEF, IRAD)	REFID=20407

NODE=M175

$f_0(1500)$

$$I^G(J^{PC}) = 0^+(0^{++})$$

See also the mini-reviews on scalar mesons under $f_0(500)$ (see the index for the page number) and on non- $q\bar{q}$ candidates in PDG 06, Journal of Physics, G **33** 1 (2006).

NODE=M152

NODE=M152

$f_0(1500)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1505± 6 OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.			
1466± 6± 20		ABLIKIM 06V	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$	
1515±12		1 BARBERIS 00A		$450\ pp \rightarrow p_f\eta\eta p_s$	
1511± 9		1,2 BARBERIS 00C		$450\ pp \rightarrow p_f4\pi p_s$	
1510± 8		1 BARBERIS 00E		$450\ pp \rightarrow p_f\eta\eta p_s$	
1522±25		BERTIN 98	OBLX	$0.05\text{--}0.405\ \bar{p}p \rightarrow \pi^+\pi^+\pi^-$	
1449±20		1 BERTIN 97C	OBLX	$0.0\ \bar{p}p \rightarrow \pi^+\pi^-\pi^0$	
1515±20		ABELE 96B	CBAR	$0.0\ \bar{p}p \rightarrow \pi^0 K_L^0 K_L^0$	
1500±15		3 AMSLER 95B	CBAR	$0.0\ \bar{p}p \rightarrow 3\pi^0$	
1505±15		4 AMSLER 95C	CBAR	$0.0\ \bar{p}p \rightarrow \eta\eta\pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					OCCUR=2
1486±10		1 ANISOVICH 09	RVUE	$0.0\ \bar{p}p, \pi N$	
1470±60	568	5 KLEMPT 08	E791	$D_s^+ \rightarrow \pi^-\pi^+\pi^+$	
1470 ₋₇ ⁺⁶ ₋₂₅₅ ⁺⁷²		6 UEHARA 08A	BELL	$10.6\ e^+e^- \rightarrow e^+e^-\pi^0\pi^0$	
1495± 4		AMSLER 06	CBAR	$0.9\ \bar{p}p \rightarrow K^+K^-\pi^0$	
1539±20	9.9k	AUBERT 060	BABR	$B^+ \rightarrow K^+K^+K^-$	
1473± 5	80k	7,8 UMAN 06	E835	$5.2\ \bar{p}p \rightarrow \eta\eta\pi^0$	
1478± 6		VLADIMIRSK...06	SPEC	$40\ \pi^-p \rightarrow K_S^0 K_S^0 n$	
1493± 7		7 BINON 05	GAMS	$33\ \pi^-p \rightarrow \eta\eta n$	
1524±14	1400	9 GARMASH 05	BELL	$B^+ \rightarrow K^+K^+K^-$	
1489 ₋₄ ⁺⁸		10 ANISOVICH 03	RVUE		
1490±30		7 ABELE 01	CBAR	$0.0\ \bar{p}d \rightarrow \pi^-4\pi^0 p$	
1497±10		7 BARBERIS 99	OMEG	$450\ pp \rightarrow p_s p_f K^+ K^-$	
1502±10		7 BARBERIS 99B	OMEG	$450\ pp \rightarrow p_s p_f \pi^+\pi^-$	
1502±12± 10		11 BARBERIS 99D	OMEG	$450\ pp \rightarrow K^+K^-, \pi^+\pi^-$	
1530±45		7 BELLAZZINI 99	GAM4	$450\ pp \rightarrow pp\pi^0\pi^0$	
1505±18		7 FRENCH 99		$300\ pp \rightarrow p_f(K^+K^-)p_s$	
1447±27		12 KAMINSKI 99	RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$	
1580±80		7 ALDE 98	GAM4	$100\ \pi^-p \rightarrow \pi^0\pi^0n$	
1499± 8		1 ANISOVICH 98B	RVUE	Compilation	
~ 1520		REYES 98	SPEC	$800\ pp \rightarrow p_s p_f K_S^0 K_S^0$	
1510±20		1 BARBERIS 97B	OMEG	$450\ pp \rightarrow pp2(\pi^+\pi^-)$	
~ 1475		FRABETTI 97D	E687	$D_s^\pm \rightarrow \pi^\mp\pi^\pm\pi^\pm$	
~ 1505		ABELE 96	CBAR	$0.0\ \bar{p}p \rightarrow 5\pi^0$	
1500± 8		1 ABELE 96C	RVUE	Compilation	
1460±20	120	7 AMELIN 96B	VES	$37\ \pi^-A \rightarrow \eta\eta\pi^-A$	
1500± 8		BUGG 96	RVUE		
1500±10		13 AMSLER 95D	CBAR	$0.0\ \bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$	
1445± 5		14 ANTINORI 95	OMEG	$300,450\ pp \rightarrow pp2(\pi^+\pi^-)$	

NODE=M152M

NODE=M152M

1497±30	7	ANTINORI	95	OMEG	300,450	$p p \rightarrow p p \pi^+ \pi^-$
~1505		BUGG	95	MRK3	$J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$	
1446± 5	7	ABATZIS	94	OMEG	450	$p p \rightarrow p p 2(\pi^+ \pi^-)$
1545±25	7	AMSLER	94E	CBAR	0.0	$\bar{p} p \rightarrow \pi^0 \eta \eta'$
1520±25	1,15	ANISOVICH	94	CBAR	0.0	$\bar{p} p \rightarrow 3\pi^0, \pi^0 \eta \eta$
1505±20	1,16	BUGG	94	RVUE	$\bar{p} p \rightarrow 3\pi^0, \eta \eta \pi^0, \eta \pi^0 \pi^0$	
1560±25	7	AMSLER	92	CBAR	0.0	$\bar{p} p \rightarrow \pi^0 \eta \eta$
1550±45± 30	7	BELADIDZE	92C	VES	36	$\pi^- Be \rightarrow \pi^- \eta' \eta Be$
1449± 4	7	ARMSTRONG	89E	OMEG	300	$p p \rightarrow p p 2(\pi^+ \pi^-)$
1610±20	7	ALDE	88	GAM4	300	$\pi^- N \rightarrow \pi^- N 2\eta$
~1525		ASTON	88D	LASS	11	$K^- p \rightarrow K_S^0 K_S^0 \Lambda$
1570±20	600	7	ALDE	GAM4	100	$\pi^- p \rightarrow 4\pi^0 n$
1575±45	17	ALDE	86D	GAM4	100	$\pi^- p \rightarrow 2\eta n$
1568±33	7	BINON	84C	GAM2	38	$\pi^- p \rightarrow \eta \eta' n$
1592±25	7	BINON	83	GAM2	38	$\pi^- p \rightarrow 2\eta n$
1525± 5	7	GRAY	83	DBC	0.0	$\bar{p} N \rightarrow 3\pi$

1 T-matrix pole.

2 Average between $\pi^+ \pi^- 2\pi^0$ and $2(\pi^+ \pi^-)$.

3 T-matrix pole, supersedes ANISOVICH 94.

4 T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92.

5 Reanalysis of AITALA 01A data. This state could also be $f_0(1370)$.6 Breit-Wigner mass. May also be the $f_0(1370)$.

7 Breit-Wigner mass.

8 Statistical error only.

9 Breit-Wigner, solution 1, PWA ambiguous.

10 K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K \bar{K} n$,
 $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p} p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$,
 $K^+ K_S^0 \pi^-$ at rest, $\bar{p} n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.

11 Supersedes BARBERIS 99 and BARBERIS 99B.

12 T-matrix pole on sheet $-- +$.

13 T-matrix pole. Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

14 Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass.

15 From a simultaneous analysis of the annihilations $\bar{p} p \rightarrow 3\pi^0, \pi^0 \eta \eta$.

16 Reanalysis of ANISOVICH 94 data.

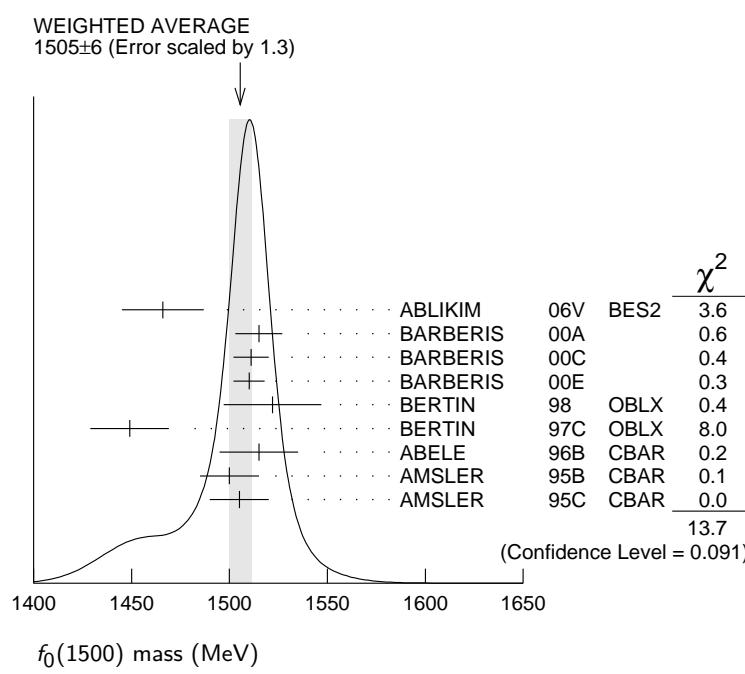
17 From central value and spread of two solutions. Breit-Wigner mass.

OCCUR=2

NODE=M152M;LINKAGE=PP
NODE=M152M;LINKAGE=PC
NODE=M152M;LINKAGE=D
NODE=M152M;LINKAGE=D1
NODE=M152M;LINKAGE=KL
NODE=M152M;LINKAGE=UE
NODE=M152M;LINKAGE=E
NODE=M152M;LINKAGE=ST
NODE=M152M;LINKAGE=GA
NODE=M152M;LINKAGE=KM

NODE=M152M;LINKAGE=BD
NODE=M152M;LINKAGE=TK
NODE=M152M;LINKAGE=AB

NODE=M152M;LINKAGE=B
NODE=M152M;LINKAGE=A
NODE=M152M;LINKAGE=C1
NODE=M152M;LINKAGE=AZ

 **$f_0(1500)$ WIDTH**

NODE=M152W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
109± 7 OUR AVERAGE					NODE=M152W
108 ₋ ⁺ 14 ₋ ⁺ 25		ABLIKIM 06v	BES2	$e^+ e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$	
110± 24	18	BARBERIS 00A		$450 \bar{p}p \rightarrow p_f \eta \eta p_s$	
102± 18	18,19	BARBERIS 00C		$450 \bar{p}p \rightarrow p_f 4\pi p_s$	
110± 16	18	BARBERIS 00E		$450 \bar{p}p \rightarrow p_f \eta \eta p_s$	
108± 33		BERTIN 98	OBLX	$0.05-0.405 \bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$	
114± 30	18	BERTIN 97C	OBLX	$0.0 \bar{p}p \rightarrow \pi^+ \pi^- \pi^0$	
105± 15		ABELE 96B	CBAR	$0.0 \bar{p}p \rightarrow \pi^0 K_L^0 K_L^0$	
120± 25	20	AMSLER 95B	CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0$	
120± 30	21	AMSLER 95C	CBAR	$0.0 \bar{p}p \rightarrow \eta \eta \pi^0$	OCCUR=2
• • • We do not use the following data for averages, fits, limits, etc. • • •					
114± 10	18	ANISOVICH 09	RVUE	$0.0 \bar{p}p, \pi N$	
90 ₋ ⁺ 2 ₋ ⁺⁵⁰	1-22	UEHARA 08A	BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$	
121± 8		AMSLER 06	CBAR	$0.9 \bar{p}p \rightarrow K^+ K^- \pi^0$	
257± 33	9.9k	AUBERT 060	BABR	$B^+ \rightarrow K^+ K^+ K^-$	
108± 9	80k	UMAN 23,24	E835	$5.2 \bar{p}p \rightarrow \eta \eta \pi^0$	
119± 10		VLADIMIRSK...06	SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n$	
90± 15		BINON 05	GAMS	$33 \pi^- p \rightarrow \eta \eta n$	
136± 23	1400	25 GARMASH	05	$B^+ \rightarrow K^+ K^+ K^-$	
102± 10		26 ANISOVICH	03	RVUE	
140± 40		23 ABELE	01	$CBAR 0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$	
104± 25		23 BARBERIS	99	$OMEG 450 \bar{p}p \rightarrow p_s p_f K^+ K^-$	
131± 15		23 BARBERIS	99B	$OMEG 450 \bar{p}p \rightarrow p_s p_f \pi^+ \pi^-$	
98± 18±16		27 BARBERIS	99D	$OMEG 450 \bar{p}p \rightarrow K^+ K^-, \pi^+ \pi^-$	
160± 50		23 BELLAZZINI	99	$GAM4 450 \bar{p}p \rightarrow p p \pi^0 \pi^0$	
100± 33		23 FRENCH	99	$300 \bar{p}p \rightarrow p_f (K^+ K^-) p_s$	
108± 46		28 KAMINSKI	99	$RVUE \pi\pi \rightarrow \pi\pi, K\bar{K}, \sigma\sigma$	
280±100		23 ALDE	98	$GAM4 100 \pi^- p \rightarrow \pi^0 \pi^0 n$	
130± 20		18 ANISOVICH	98B	RVUE Compilation	
120± 35		18 BARBERIS	97B	$OMEG 450 \bar{p}p \rightarrow p p 2(\pi^+ \pi^-)$	
~ 100		FRABETTI 97D	E687	$D_s^\pm \rightarrow \pi^\mp \pi^\pm \pi^\pm$	
~ 169		ABELE 96	CBAR	$0.0 \bar{p}p \rightarrow 5\pi^0$	
100± 30	120	23 AMELIN	96B	$VES 37 \pi^- A \rightarrow \eta \eta \pi^- A$	
132± 15		BUGG 96	RVUE		
154± 30		29 AMSLER	95D	$CBAR 0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta \eta, \pi^0 \pi^0 \eta$	
65± 10		30 ANTINORI	95	$OMEG 300, 450 \bar{p}p \rightarrow p p 2(\pi^+ \pi^-)$	
199± 30		23 ANTINORI	95	$OMEG 300, 450 \bar{p}p \rightarrow p p \pi^+ \pi^-$	OCCUR=2
56± 12		23 ABATZIS	94	$OMEG 450 \bar{p}p \rightarrow p p 2(\pi^+ \pi^-)$	
100± 40		23 AMSLER	94E	$CBAR 0.0 \bar{p}p \rightarrow \pi^0 \eta \eta'$	
148 ₋ ⁺ 20 ₋ ⁺ 25		18,31 ANISOVICH	94	$CBAR 0.0 \bar{p}p \rightarrow 3\pi^0, \pi^0 \eta \eta$	
150± 20		18,32 BUGG	94	$RVUE \bar{p}p \rightarrow 3\pi^0, \eta \eta \pi^0, \eta \pi^0 \pi^0$	
245± 50		23 AMSLER	92	$CBAR 0.0 \bar{p}p \rightarrow \pi^0 \eta \eta$	
153± 67±50		23 BELADIDZE	92C	$VES 36 \pi^- Be \rightarrow \pi^- \eta' \eta Be$	
78± 18		23 ARMSTRONG	89E	$OMEG 300 \bar{p}p \rightarrow p p 2(\pi^+ \pi^-)$	
170± 40		23 ALDE	88	$GAM4 300 \pi^- N \rightarrow \pi^- N 2\eta$	
150± 20	600	23 ALDE	87	$GAM4 100 \pi^- p \rightarrow 4\pi^0 n$	
265± 65		33 ALDE	86D	$GAM4 100 \pi^- p \rightarrow 2\eta n$	
260± 60		23 BINON	84C	$GAM2 38 \pi^- p \rightarrow \eta \eta' n$	
210± 40		23 BINON	83	$GAM2 38 \pi^- p \rightarrow 2\eta n$	
101± 13		23 GRAY	83	$DBC 0.0 \bar{p}N \rightarrow 3\pi$	
18 T-matrix pole.					
19 Average between $\pi^+ \pi^- 2\pi^0$ and $2(\pi^+ \pi^-)$.					
20 T-matrix pole, supersedes ANISOVICH 94.					
21 T-matrix pole, supersedes ANISOVICH 94 and AMSLER 92.					
22 Breit-Wigner width. May also be the $f_0(1370)$.					
23 Breit-Wigner width.					
24 Statistical error only.					
25 Breit-Wigner, solution 1, PWA ambiguous.					
26 K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n, \pi^- p \rightarrow K\bar{K}n, \pi^+ \pi^- \rightarrow \pi^+ \pi^-, \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta \eta, \pi^0 \eta \eta', \pi^+ \pi^- \pi^0, K^+ K^- \pi^0, K_S^0 K_S^0 \pi^0, K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+, K_S^0 K^- \pi^0, K_S^0 K_S^0 \pi^-$ at rest.					

- 27 Supersedes BARBERIS 99 and BARBERIS 99B.
 28 T-matrix pole on sheet — +.
 29 T-matrix pole. Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AM-
 SLER 94D.
 30 Supersedes ABATZIS 94, ARMSTRONG 89E. Breit-Wigner mass.
 31 From a simultaneous analysis of the annihilations $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta\eta$.
 32 Reanalysis of ANISOVICH 94 data.
 33 From central value and spread of two solutions. Breit-Wigner mass.

NODE=M152W;LINKAGE=BD
 NODE=M152W;LINKAGE=TK
 NODE=M152W;LINKAGE=AB
 NODE=M152W;LINKAGE=B
 NODE=M152W;LINKAGE=A
 NODE=M152W;LINKAGE=C1
 NODE=M152W;LINKAGE=AZ

NODE=M152215;NODE=M152

$f_0(1500)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor
$\Gamma_1 \pi\pi$	(34.9±2.3) %	1.2
$\Gamma_2 \pi^+\pi^-$	seen	
$\Gamma_3 2\pi^0$	seen	
$\Gamma_4 4\pi$	(49.5±3.3) %	1.2
$\Gamma_5 4\pi^0$	seen	
$\Gamma_6 2\pi^+2\pi^-$	seen	
$\Gamma_7 2(\pi\pi)_S$ -wave	seen	
$\Gamma_8 \rho\rho$	seen	
$\Gamma_9 \pi(1300)\pi$	seen	
$\Gamma_{10} a_1(1260)\pi$	seen	
$\Gamma_{11} \eta\eta$	(5.1±0.9) %	1.4
$\Gamma_{12} \eta\eta'(958)$	(1.9±0.8) %	1.7
$\Gamma_{13} K\bar{K}$	(8.6±1.0) %	1.1
$\Gamma_{14} \gamma\gamma$	not seen	

DESIG=8
 DESIG=9
 DESIG=3;OUR EST;→ UNCHECKED ←
 DESIG=7
 DESIG=5;OUR EST;→ UNCHECKED ←
 DESIG=6;OUR EST;→ UNCHECKED ←
 DESIG=11;OUR EST;→ UNCHECKED ←
 DESIG=12;OUR EST;→ UNCHECKED ←
 DESIG=13;OUR EST;→ UNCHECKED ←
 DESIG=14;OUR EST;→ UNCHECKED ←
 DESIG=1
 DESIG=2
 DESIG=4
 DESIG=10;OUR EST;→ UNCHECKED ←

CONSTRAINED FIT INFORMATION

An overall fit to 6 branching ratios uses 10 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 11.4$ for 6 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_4	—83			
x_{11}	11	—52		
x_{12}	—5	—31	29	
x_{13}	39	—67	33	6
	x_1	x_4	x_{11}	x_{12}

$f_0(1500)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_1\Gamma_{14}/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
33 ⁺¹² _{−6} ⁺¹⁸⁰⁹ _{−21}	34	UEHARA	08A BELL	10.6 $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
not seen		ACCIARRI	01H L3	$\gamma\gamma \rightarrow K_S^0 K_S^0, E_{\text{cm}} = 91, 183\text{-}209 \text{ GeV}$
<460	95	BARATE	00E ALEP	$\gamma\gamma \rightarrow \pi^+ \pi^-$
34 May also be the $f_0(1370)$. Multiplied by us by 3 to obtain the $\pi\pi$ value.				

NODE=M152217

NODE=M152G1
 NODE=M152G1

NODE=M152G1;LINKAGE=UE

NODE=M152220

NODE=M152R8
 NODE=M152R8

$f_0(1500)$ BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$	Γ_1/Γ	
VALUE	DOCUMENT ID	TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •		
0.454±0.104	BUGG	96 RVUE

$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_2/Γ
seen	BERTIN	98	OBLX	$0.05-0.405 \bar{n}p \rightarrow \pi^+\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

possibly seen

FRABETTI 97D E687 $D_s^\pm \rightarrow \pi^\mp\pi^\pm\pi^\pm$ $\Gamma(4\pi)/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ_1
1.42±0.18 OUR FIT			Error includes scale factor of 1.2.	
1.42±0.18 OUR AVERAGE			Error includes scale factor of 1.2.	
1.37±0.16	BARBERIS	00D	$450 pp \rightarrow p_f 4\pi p_s$	
2.1 ± 0.6	35 AMSLER	98	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.1 ± 0.2	36 ANISOVICH	02D	SPEC	Combined fit
3.4 ± 0.8	35 ABELE	96	CBAR	$0.0 \bar{p}p \rightarrow 5\pi^0$

NODE=M152R10
NODE=M152R10 $\Gamma(2(\pi\pi)s\text{-wave})/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ_1
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.42±0.26	37 ABELE	01	CBAR	$0.0 \bar{p}d \rightarrow \pi^- 4\pi^0 p$

NODE=M152R14
NODE=M152R14 $\Gamma(2(\pi\pi)s\text{-wave})/\Gamma(4\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ_4
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.26±0.07	ABELE	01B	CBAR	$0.0 \bar{p}d \rightarrow 5\pi p$

NODE=M152R15
NODE=M152R15 $\Gamma(\rho\rho)/\Gamma(4\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_8/Γ_4
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13±0.08	ABELE	01B	CBAR	$0.0 \bar{p}d \rightarrow 5\pi p$

NODE=M152R16
NODE=M152R16 $\Gamma(\rho\rho)/\Gamma(2(\pi\pi)s\text{-wave})$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>	Γ_8/Γ_7
• • • We do not use the following data for averages, fits, limits, etc. • • •			
3.3±0.5	BARBERIS	00C	$450 pp \rightarrow p_f \pi^+ \pi^- 2\pi^0 p_s$
2.6±0.4	BARBERIS	00C	$450 pp \rightarrow p_f 2(\pi^+ \pi^-) p_s$

NODE=M152R11
NODE=M152R11

OCCUR=2

 $\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_9/Γ_4
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.50±0.25	ABELE	01B	CBAR	$0.0 \bar{p}d \rightarrow 5\pi p$

NODE=M152R17
NODE=M152R17 $\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{10}/Γ_4
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.12±0.05	ABELE	01B	CBAR	$0.0 \bar{p}d \rightarrow 5\pi p$

NODE=M152R18
NODE=M152R18 $\Gamma(\eta\eta)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{11}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
large	ALDE	88	GAM4	$300 \pi^- N \rightarrow \eta\eta\pi^- N$
large	BINON	83	GAM2	$38 \pi^- p \rightarrow 2\eta n$

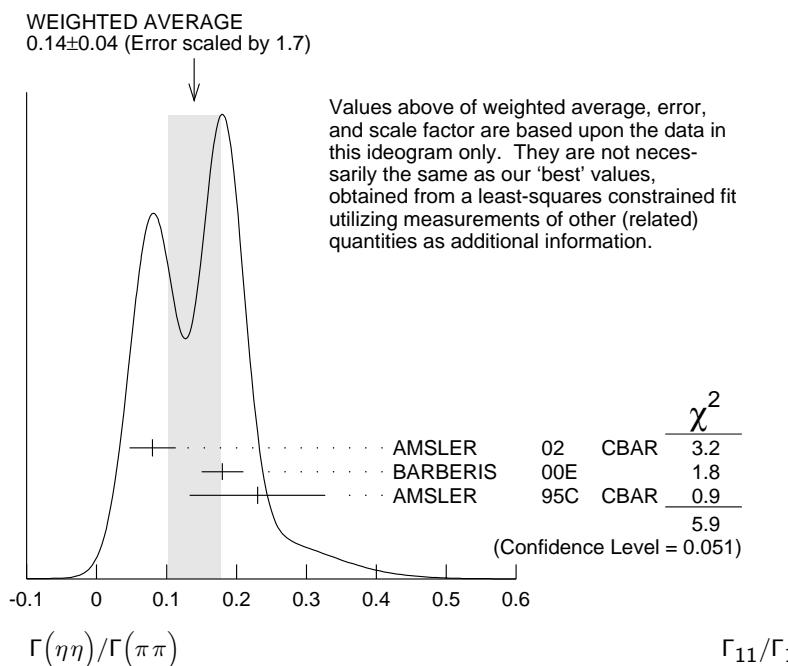
NODE=M152R1
NODE=M152R1 $\Gamma(\eta\eta)/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{11}/Γ_1
0.145±0.027 OUR FIT			Error includes scale factor of 1.5.	
0.14 ± 0.04 OUR AVERAGE			Error includes scale factor of 1.7. See the ideogram below.	
0.080±0.033	AMSLER	02	CBAR	$0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0 \pi^0$
0.18 ± 0.03	BARBERIS	00E		$450 pp \rightarrow p_f \eta\eta p_s$
0.230±0.097	38 AMSLER	95C	CBAR	$0.0 \bar{p}p \rightarrow \eta\eta\pi^0$

NODE=M152R13
NODE=M152R13

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.11 ± 0.03	36 ANISOVICH	02D SPEC	Combined fit
0.078 ± 0.013	39 ABELE	96C RVUE	Compilation
0.157 ± 0.060	40 AMSLER	95D CBAR	0.0 $\bar{p}p \rightarrow \pi^0\pi^0\pi^0, \pi^0\eta\eta, \pi^0\pi^0\eta$



$\Gamma(4\pi^0)/\Gamma(\eta\eta)$

VALUE DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.8 ± 0.3	ALDE	87 GAM4	100 $\pi^- p \rightarrow 4\pi^0 n$
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Γ_5/Γ_{11}

NODE=M152R5
NODE=M152R5

$\Gamma(\eta\eta'(958))/\Gamma(\pi\pi)$

VALUE DOCUMENT ID TECN COMMENT

0.055 ± 0.024 OUR FIT Error includes scale factor of 1.8.

0.095 ± 0.026	BARBERIS	00A	$450 pp \rightarrow p_f \eta\eta p_s$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.005 ± 0.003	36 ANISOVICH	02D SPEC	Combined fit
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Γ_{12}/Γ_1

NODE=M152R12
NODE=M152R12

$\Gamma(\eta\eta'(958))/\Gamma(\eta\eta)$

VALUE DOCUMENT ID TECN COMMENT

0.38 ± 0.16 OUR FIT Error includes scale factor of 1.9.

0.29 ± 0.10	41 AMSLER	95C CBAR	$0.0 \bar{p}p \rightarrow \eta\eta\pi^0$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.05 ± 0.03	36 ANISOVICH	02D SPEC	Combined fit
0.84 ± 0.23	ABELE	96C RVUE	Compilation
2.7 ± 0.8	BINON	84C GAM2	$38 \pi^- p \rightarrow \eta\eta' n$

Γ_{12}/Γ_{11}

NODE=M152R2
NODE=M152R2

$\Gamma(K\bar{K})/\Gamma_{\text{total}}$

VALUE DOCUMENT ID TECN

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.044 ± 0.021	BUGG	96 RVUE
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Γ_{13}/Γ

NODE=M152R9
NODE=M152R9

$\Gamma(K\bar{K})/\Gamma(\pi\pi)$

VALUE DOCUMENT ID TECN COMMENT

0.246 ± 0.026 OUR FIT

0.241 ± 0.028 OUR AVERAGE

0.25 ± 0.03	42 BARGIOTTI	03 OBLX	$\bar{p}p$
0.19 ± 0.07	43 ABELE	98 CBAR	$0.0 \bar{p}p \rightarrow K_L^0 K^\pm \pi^\mp$
0.16 ± 0.05	36 ANISOVICH	02D SPEC	Combined fit

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.33 ± 0.03 ± 0.07	BARBERIS	99D OMEG	$450 pp \rightarrow K^+ K^-, \pi^+ \pi^-$
0.20 ± 0.08	44 ABELE	96B CBAR	$0.0 \bar{p}p \rightarrow \pi^0 K_L^0 K_L^0$

Γ_{13}/Γ_1

NODE=M152R7
NODE=M152R7

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ_{11}
1.69±0.33 OUR FIT		Error includes scale factor of 1.4.			
1.85±0.41		BARBERIS 00E	450 $p p \rightarrow p_f \eta \eta p_s$		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.5 ± 0.6	36	ANISOVICH 02D	SPEC	Combined fit	
<0.4	90	PROKOSHKIN 91	GAM4	$300 \pi^- p \rightarrow \pi^- p \eta \eta$	
<0.6	46	BINON 83	GAM2	$38 \pi^- p \rightarrow 2\eta n$	
35 Excluding $\rho\rho$ contribution to 4π .					
36 From a combined K-matrix analysis of Crystal Barrel (0. $p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$), GAMS ($\pi p \rightarrow \pi^0 \pi^0 n$, $\eta \eta n$, $\eta \eta' n$), and BNL ($\pi p \rightarrow K\bar{K} n$) data.					
37 From the combined data of ABELE 96 and ABELE 96C.					
38 Using AMSLER 95B ($3\pi^0$).					
39 2π width determined to be 60 ± 12 MeV.					
40 Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.					
41 Using AMSLER 94E ($\eta \eta' \pi^0$).					
42 Coupled channel analysis of $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, and $K^\pm K_S^0 \pi^\mp$.					
43 Using $\pi^0 \pi^0$ from AMSLER 95B.					
44 Using AMSLER 95B ($3\pi^0$), AMSLER 94C ($2\pi^0 \eta$) and SU(3).					
45 Combining results of GAM4 with those of WA76 on $K\bar{K}$ central production.					
46 Using ETKIN 82B and COHEN 80.					

NODE=M152R4

NODE=M152R4

NODE=M152R6;LINKAGE=C
NODE=M152R;LINKAGE=CHNODE=M152R;LINKAGE=KZ
NODE=M152R3;LINKAGE=A
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NODE=M152R7;LINKAGE=D
NODE=M152R4;LINKAGE=BZ
NODE=M152R4;LINKAGE=A**f₀(1500) REFERENCES**

ANISOVICH 09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev			
KLEMPI 08	EPJ C55 39	E. Klemt, M. Matveev, A.V. Sarantsev	(BONN+)		
UEHARA 08A	PR D78 052004	S. Uehara et al.	(BELLE Collab.)		
ABLIMK 06V	PL B642 441	M. Ablikim et al.	(BES Collab.)		
AMSLER 06	PL B639 165	C. Amsler et al.	(CBAR Collab.)		
AUBERT 06O	PR D74 032003	B. Aubert et al.	(BABAR Collab.)		
PDG 06	JPG 33 1	W.-M. Yao et al.	(PDG Collab.)		
UMAN 06	PR D73 052009	I. Uman et al.	(FNAL E835)		
VLADIMIRSK... 06	PAN 69 493	V.V. Vladimirska et al.	(ITEP, Moscow)		
BINON 05	PAN 68 960	Translated from YAF 69 515. F. Binon et al.			
GARMASH 05	PR D71 092003	Translated from YAF 68 998. A. Garmash et al.	(BELLE Collab.)		
ANISOVICH 03	EPJ A16 229	V.V. Anisovich et al.			
BARGIOTTI 03	EPJ C26 371	M. Bargiotti et al.	(OBELIX Collab.)		
AMSLER 02	EPJ C23 29	C. Amsler et al.			
ANISOVICH 02D	PAN 65 1545	V.V. Anisovich et al.			
ABELE 01	EPJ C19 667	A. Abele et al.	(Crystal Barrel Collab.)		
ABELE 01B	EPJ C21 261	A. Abele et al.	(Crystal Barrel Collab.)		
ACCIARRI 01H	PL B501 173	M. Acciari et al.	(L3 Collab.)		
AITALA 01A	PRL 86 765	E.M. Aitala et al.	(FNAL E791 Collab.)		
BARATE 00E	PL B472 189	R. Barate et al.	(ALEPH Collab.)		
BARBERIS 00A	PL B471 429	D. Barberis et al.	(WA 102 Collab.)		
BARBERIS 00C	PL B471 440	D. Barberis et al.	(WA 102 Collab.)		
BARBERIS 00D	PL B474 423	D. Barberis et al.	(WA 102 Collab.)		
BARBERIS 00E	PL B479 59	D. Barberis et al.	(WA 102 Collab.)		
BARBERIS 99	PL B453 305	D. Barberis et al.	(Omega Expt.)		
BARBERIS 99B	PL B453 316	D. Barberis et al.	(Omega Expt.)		
BARBERIS 99D	PL B462 462	D. Barberis et al.	(Omega Expt.)		
BELLAZZINI 99	PL B467 296	R. Bellazzini et al.			
FRENCH 99	PL B460 213	B. French et al.	(WA76 Collab.)		
KAMINSKI 99	EPJ C9 141	R. Kaminski, L. Lesniak, B. Loiseau	(CRAC, PARIN)		
ABELE 98	PR D57 3860	A. Abele et al.	(Crystal Barrel Collab.)		
ALDE 98	EPJ A3 361	D. Alde et al.	(GAM4 Collab.)		
Also	PAN 62 405	D. Alde et al.	(GAMS Collab.)		
AMSLER 98	RMP 70 1293	Translated from YAF 62 446. C. Amsler			
ANISOVICH 98B	SPU 41 419	V.V. Anisovich et al.			
BERTIN 98	PR D57 55	Translated from UFN 168 481. A. Bertin et al.	(OBELIX Collab.)		
REYES 98	PR 81 4079	M.A. Reyes et al.			
BARBERIS 97B	PL B413 217	D. Barberis et al.	(WA 102 Collab.)		
BERTIN 97C	PL B408 476	A. Bertin et al.	(OBELIX Collab.)		
FRABETTI 97D	PL B407 79	P.L. Frabetti et al.	(FNAL E687 Collab.)		
ABELE 96	PL B380 453	A. Abele et al.	(Crystal Barrel Collab.)		
ABELE 96B	PL B385 425	A. Abele et al.	(Crystal Barrel Collab.)		
ABELE 96C	NP A609 562	A. Abele et al.	(Crystal Barrel Collab.)		
AMELIN 96B	PAN 59 976	D.V. Amelin et al.	(SERP, TBL)		
BUGG 96	NP B471 59	D.V. Bugg, A.V. Sarantsev, B.S. Zou	(LOQM, PNPI)		
AMSLER 95B	PL B342 433	C. Amsler et al.	(Crystal Barrel Collab.)		
AMSLER 95C	PL B353 571	C. Amsler et al.	(Crystal Barrel Collab.)		
AMSLER 95D	PL B355 425	C. Amsler et al.	(Crystal Barrel Collab.)		
ANTINORI 95	PL B353 589	F. Antinori et al.	(ATHU, BARI, BIRM+)		
BUGG 95	PL B353 378	D.V. Bugg et al.	(LOQM, PNPI, WASH)		
ABATZIS 94	PL B324 509	S. Abatzas et al.	(ATHU, BARI, BIRM+)		
AMSLER 94C	PL B327 425	C. Amsler et al.	(Crystal Barrel Collab.)		
AMSLER 94D	PL B333 277	C. Amsler et al.	(Crystal Barrel Collab.)		
AMSLER 94E	PL B340 259	C. Amsler et al.	(Crystal Barrel Collab.)		
ANISOVICH 94	PL B323 233	V.V. Anisovich et al.	(Crystal Barrel Collab.)		
BUGG 94	PR D50 4412	D.V. Bugg et al.	(LOQM)		
AMSLER 92	PL B291 347	C. Amsler et al.	(Crystal Barrel Collab.)		
BELADIDZE 92C	SJNP 55 1535	G.M. Beladidze, S.I. Bityukov, G.V. Borisov	(SERP+)		
PROKOSHKIN 91	SPD 36 155	Y.D. Prokoshkin	(GAM2, GAM4 Collab.)		
ARMSTRONG 89E	PL B228 536	Translated from DANS 316 900.			
ARMSTRONG 89E	PL B201 160	I.A. Armstrong, M. Benayoun	(ATHU, BARI, BIRM+)		
ALDE 88	NP B301 525	D.M. Alde et al.	(SERP, BELG, LANL, LAPP+)		
ASTON 88D	PL B198 286	D. Aston et al.	(SLAC, NAGO, CINC, INUS)		
ALDE 87	NP B269 485	D.M. Alde et al.	(LANL, BRUX, SERP, LAPP)		
BINON 84C	NC 80A 363	F.G. Binon et al.	(BELG, LAPP, SERP+)		
BINON 84C	NC 78A 313	F.G. Binon et al.	(BELG, LAPP, SERP+)		
Also	SJNP 38 561	F.G. Binon et al.	(BELG, LAPP, SERP+)		
GRAY 83	PR D27 307	L. Gray et al.	(SYRA)		
ETKIN 82B	PR D25 1786	A. Etkin et al.	(BNL, CUNY, TUFTS, VAND)		
COHEN 80	PR D22 2595	D. Cohen et al.	(ANL)		

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$f_1(1510)$ $I^G(J^{PC}) = 0^+(1^{++})$

OMMITTED FROM SUMMARY TABLE

See the minireview under $\eta(1405)$.

NODE=M084

 $f_1(1510)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1518± 5 OUR AVERAGE				Error includes scale factor of 1.7. See the ideogram below.
1530±10		ASTON	88C LASS	$11 K^- p \rightarrow K_S^0 K^\pm \pi^\mp \Lambda$
1512± 4	600	¹ BIRMAN	88 MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
1526± 6	271	GAVILLET	82 HBC	$4.2 K^- p \rightarrow \Lambda K K \pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~1525		² BAUER	93B	$\gamma\gamma^* \rightarrow \pi^+ \pi^- \pi^0 \pi^0$

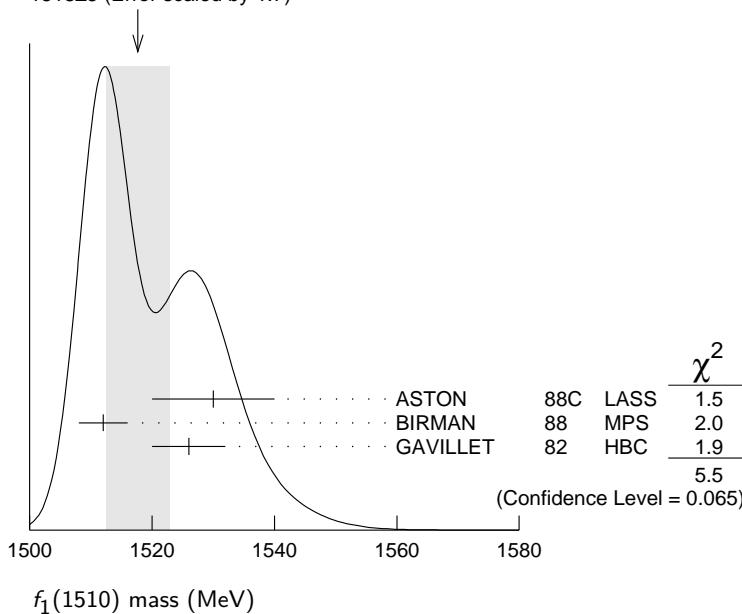
¹ From partial wave analysis of $K^+ \bar{K}^0 \pi^-$ state.² Not seen by AIHARA 88C in the $K_S^0 K^\pm \pi^\mp$ final state.

NODE=M084

NODE=M084M

NODE=M084M

WEIGHTED AVERAGE
1518±5 (Error scaled by 1.7)

 $f_1(1510)$ mass (MeV) **$f_1(1510)$ WIDTH**

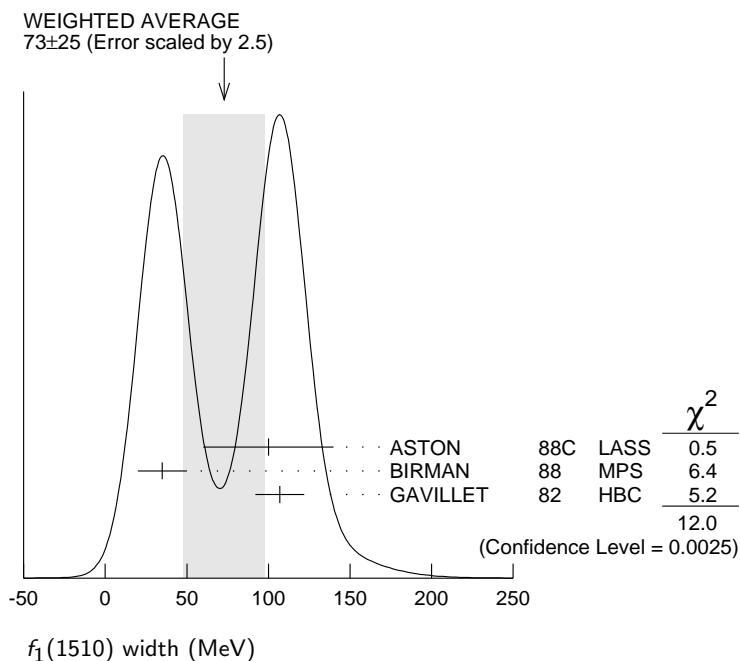
NODE=M084W

NODE=M084W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
73±25 OUR AVERAGE				Error includes scale factor of 2.5. See the ideogram below.
100±40		ASTON	88C LASS	$11 K^- p \rightarrow K_S^0 K^\pm \pi^\mp \Lambda$
35±15	600	³ BIRMAN	88 MPS	$8 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- n$
107±15	271	GAVILLET	82 HBC	$4.2 K^- p \rightarrow \Lambda K K \pi$

³ From partial wave analysis of $K^+ \bar{K}^0 \pi^-$ state.

NODE=M084W;LINKAGE=A



$f_1(1510)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad K\bar{K}^*(892) + \text{c.c.}$	seen
$\Gamma_2 \quad \pi^+\pi^-\eta'$	seen

$f_1(1510)$ BRANCHING RATIOS

$\Gamma(\pi^+\pi^-\eta')/\Gamma_{\text{total}}$	EVTS	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>	Γ_2/Γ
seen	230	ABLIKIM	11C	BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$

$f_1(1510)$ REFERENCES

ABLIKIM	11C	PRL 106 072002	M. Ablikim <i>et al.</i>	(BES III Collab.)
BAUER	93B	PR D48 3976	D.A. Bauer <i>et al.</i>	(SLAC)
AIHARA	88C	PR D38 1	H. Aihara <i>et al.</i>	(TPC-2 γ Collab.)
ASTON	88C	PL B201 573	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS) JP
BIRMAN	88	PRL 61 1557	A. Birman <i>et al.</i>	(BNL, FSU, IND, MASD) JP
GAVILLET	82	ZPHY C16 119	P. Gavillet <i>et al.</i>	(CERN, CDEF, PADO+)

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DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=2

NODE=M084225

NODE=M084R01
NODE=M084R01

NODE=M084

REFID=53684
REFID=43678
REFID=40564
REFID=40282
REFID=40568
REFID=20877

$f'_2(1525)$ $I^G(J^{PC}) = 0^+(2^{++})$

NODE=M013

 $f'_2(1525)$ MASSVALUE (MeV) DOCUMENT ID**1525±5 OUR ESTIMATE** This is only an educated guess; the error given is larger than the error on the average of the published values.**PRODUCED BY PION BEAM**VALUE (MeV) EVTS DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

1521±13	TIKHOMIROV	03	SPEC	40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
1547 ⁺¹⁰ ₋₂	1 LONGACRE	86	MPS	22 $\pi^- p \rightarrow K_S^0 K_S^0 n$
1496 ⁺⁹ ₋₈	2 CHABAUD	81	ASPK	6 $\pi^- p \rightarrow K^+ K^- n$
1497 ⁺⁸ ₋₉	CHABAUD	81	ASPK	18.4 $\pi^- p \rightarrow K^+ K^- n$
1492±29	GORLICH	80	ASPK	17 $\pi^- p$ polarized $\rightarrow K^+ K^- n$
1502±25	3 CORDEN	79	OMEG	12–15 $\pi^- p \rightarrow \pi^+ \pi^- n$
1480	CRENNELL	66	HBC	6.0 $\pi^- p \rightarrow K_S^0 K_S^0 n$

NODE=M013205

NODE=M013MX
→ UNCHECKED ←NODE=M013M1
NODE=M013M1**PRODUCED BY K^\pm BEAM**VALUE (MeV) EVTS DOCUMENT ID TECN COMMENT**1523.4± 1.3 OUR AVERAGE** Includes data from the datablock that follows this one.
Error includes scale factor of 1.1.

1526.8± 4.3	ASTON	88D	LASS	11 $K^- p \rightarrow K_S^0 K_S^0 \Lambda$
1504 ± 12	BOLONKIN	86	SPEC	40 $K^- p \rightarrow K_S^0 K_S^0 Y$
1529 ± 3	ARMSTRONG	83B	OMEG	18.5 $K^- p \rightarrow K^- K^+ \Lambda$
1521 ± 6	650	AGUILAR...	81B	HBC 4.2 $K^- p \rightarrow \Lambda K^+ K^-$
1521 ± 3	572	ALHARRAN	81	HBC 8.25 $K^- p \rightarrow \Lambda K \bar{K}$
1522 ± 6	123	BARREIRO	77	HBC 4.15 $K^- p \rightarrow \Lambda K_S^0 K_S^0$
1528 ± 7	166	EVANGELIS...	77	OMEG 10 $K^- p \rightarrow K^+ K^- (\Lambda, \Sigma)$
1527 ± 3	120	BRANDENB...	76C	ASPK 13 $K^- p \rightarrow K^+ K^- (\Lambda, \Sigma)$
1519 ± 7	100	AGUILAR...	72B	HBC 3.9, 4.6 $K^- p \rightarrow K \bar{K} (\Lambda, \Sigma)$

NODE=M013M2
NODE=M013M2

• • • We do not use the following data for averages, fits, limits, etc. • • •

1514 ± 8	61	BINON	07	GAMS 32.5 $K^- p \rightarrow \eta\eta(\Lambda/\Sigma^0)$
1513 ± 10	4	BARKOV	99	SPEC 40 $K^- p \rightarrow K_S^0 K_S^0 y$

PRODUCED IN $e^+ e^-$ ANNIHILATIONVALUE (MeV) EVTS DOCUMENT ID TECN COMMENT

The data in this block is included in the average printed for a previous datablock.

NODE=M013M3
NODE=M013M3**1520.7± 2.0 OUR AVERAGE**

1521 ± 5	ABLIKIM	05	BES2	$J/\psi \rightarrow \phi K^+ K^-$
1518 ± 1 ± 3	ABE	04	BELL	10.6 $e^+ e^- \rightarrow e^+ e^- K^+ K^-$
1519 ± 2 ± 15	BAI	03G	BES	$J/\psi \rightarrow \gamma K \bar{K}$
1523 ± 6	331	5 ACCIARRI	01H L3	91, 183–209 $e^+ e^- \rightarrow e^+ e^- K_S^0 K_S^0$
1535 ± 5 ± 4	ABREU	96C	DLPH	$Z^0 \rightarrow K^+ K^- + X$
1516 ± 5 ± 15	BAI	96C	BES	$J/\psi \rightarrow \gamma K^+ K^-$
1531.6±10.0	AUGUSTIN	88	DM2	$J/\psi \rightarrow \gamma K^+ K^-$
1515 ± 5	6 FALVARD	88	DM2	$J/\psi \rightarrow \phi K^+ K^-$
1525 ± 10 ± 10	BALTRUSAIT..87	MRK3	J/ψ	$\rightarrow \gamma K^+ K^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1523 ± 5	870	7 SCHEGELSKY	06A RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$
1496 ± 2		8 FALVARD	88 DM2	$J/\psi \rightarrow \phi K^+ K^-$

OCCUR=2

PRODUCED IN $\bar{p}p$ ANNIHILATIONVALUE (MeV) DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

1530±12	9 ANISOVICH	09	RVUE	0.0 $\bar{p}p, \pi N$
1513± 4	AMSLER	06	CBAR	0.9 $\bar{p}p \rightarrow K^+ K^- \pi^0$
1508± 9	10 AMSLER	02	CBAR	0.9 $\bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$

NODE=M013M9
NODE=M013M9

CENTRAL PRODUCTION

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1515±15	BARBERIS	99	OMEG 450 $p p \rightarrow p_S p_F K^+ K^-$

PRODUCED IN $e p$ COLLISIONS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1512±3^{+1.4}_{-0.5}	11	CHEKANOV	08	ZEUS $e p \rightarrow K_S^0 K_S^0 X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1537 ⁺⁹ ₋₈	84	12 CHEKANOV	04	ZEUS $e p \rightarrow K_S^0 K_S^0 X$

¹ From a partial-wave analysis of data using a K-matrix formalism with 5 poles.² CHABAUD 81 is a reanalysis of PAWLICKI 77 data.³ From an amplitude analysis where the $f'_2(1525)$ width and elasticity are in complete disagreement with the values obtained from $K\bar{K}$ channel, making the solution dubious.⁴ Systematic errors not estimated.⁵ Supersedes ACCIARRI 95j.⁶ From an analysis ignoring interference with $f_0(1710)$.⁷ From analysis of L3 data at 91 and 183–209 GeV.⁸ From an analysis including interference with $f_0(1710)$.⁹ 4-poles, 5-channel K matrix fit.¹⁰ T-matrix pole.¹¹ In the SU(3) based model with a specific interference pattern of the $f_2(1270)$, $a_2^0(1320)$, and $f'_2(1525)$ mesons incoherently added to the $f_0(1710)$ and non-resonant background.¹² Systematic errors not estimated.NODE=M013M4
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NODE=M013M10;LINKAGE=HE

NODE=M013M10;LINKAGE=CH

NODE=M013210

NODE=M013WX

NODE=M013W1
NODE=M013W1

OCCUR=2

NODE=M013W2
NODE=M013W2 **$f'_2(1525)$ WIDTH**

VALUE (MeV)	DOCUMENT ID	COMMENT
73⁺⁶₋₅ OUR FIT		
76±10	PDG	90 For fitting

PRODUCED BY PION BEAM

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
102±42	TIKHOMIROV	03	SPEC 40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
108 ⁺⁵ ₋₂	13 LONGACRE	86	MPS 22 $\pi^- p \rightarrow K_S^0 K_S^0 n$
69 ⁺²² ₋₁₆	14 CHABAUD	81	ASPK 6 $\pi^- p \rightarrow K^+ K^- n$
137 ⁺²³ ₋₂₁	CHABAUD	81	ASPK 18.4 $\pi^- p \rightarrow K^+ K^- n$
150 ⁺⁸³ ₋₅₀	GORLICH	80	ASPK 17 $\pi^- p$ polarized $\rightarrow K^+ K^- n$
165±42	15 CORDEN	79	OMEG 12–15 $\pi^- p \rightarrow \pi^+ \pi^- n$
92 ⁺³⁹ ₋₂₂	16 POLYCHRO...	79	STRC 7 $\pi^- p \rightarrow n K_S^0 K_S^0$

PRODUCED BY K^\pm BEAM

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
80.2± 2.6 OUR AVERAGE				Includes data from the datablock that follows this one.
90 ± 12		ASTON	88D LASS	11 $K^- p \rightarrow K_S^0 K_S^0 \Lambda$
73 ± 18		BOLONKIN	86 SPEC	40 $K^- p \rightarrow K_S^0 K_S^0 Y$
83 ± 15		ARMSTRONG	83B OMEG	18.5 $K^- p \rightarrow K^- K^+ \Lambda$
85 ± 16	650	AGUILAR-...	81B HBC	4.2 $K^- p \rightarrow \Lambda K^+ K^-$
80 ± 14	572	ALHARRAN	81 HBC	8.25 $K^- p \rightarrow \Lambda K\bar{K}$
72 ± 25	166	EVANGELIS...	77 OMEG	10 $K^- p \rightarrow K^+ K^- (\Lambda, \Sigma)$
69 ± 22	100	AGUILAR-...	72B HBC	3.9, 4.6 $K^- p \rightarrow K\bar{K} (\Lambda, \Sigma)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
92 ⁺²⁵ ₋₁₆	61	BINON	07 GAMS	32.5 $K^- p \rightarrow \eta \eta (\Lambda / \Sigma^0)$
75 ± 20		17 BARKOV	99 SPEC	40 $K^- p \rightarrow K_S^0 K_S^0 y$
62 ⁺¹⁹ ₋₁₄	123	BARREIRO	77 HBC	4.15 $K^- p \rightarrow \Lambda K_S^0 K_S^0$
61 ± 8	120	BRANDENB...	76C ASPK	13 $K^- p \rightarrow K^+ K^- (\Lambda, \Sigma)$

PRODUCED IN $e^+ e^-$ ANNIHILATION

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				
79.9 ± 3.3 OUR AVERAGE				Error includes scale factor of 1.1.
77 ± 15		ABLIKIM 05	BES2	$J/\psi \rightarrow \phi K^+ K^-$
82 ± 2 ± 3		ABE 04	BELL	$10.6 e^+ e^- \rightarrow e^+ e^- K^+ K^-$
75 ± 4 ± 5		BAI 03G	BES	$J/\psi \rightarrow \gamma K\bar{K}$
100 ± 15	331	18 ACCIARRI 01H	L3	$91, 183-209 e^+ e^- \rightarrow e^+ e^- K_S^0 K_S^0$
60 ± 20 ± 19		ABREU 96C	DLPH	$Z^0 \rightarrow K^+ K^- + X$
60 ± 23 ± 13		BAI 96C	BES	$J/\psi \rightarrow \gamma K^+ K^-$
103 ± 30		AUGUSTIN 88	DM2	$J/\psi \rightarrow \gamma K^+ K^-$
62 ± 10		19 FALVARD 88	DM2	$J/\psi \rightarrow \phi K^+ K^-$
85 ± 35		BALTRUSAIT..87	MRK3	$J/\psi \rightarrow \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
104 ± 10	870	20 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$
100 ± 3		21 FALVARD 88	DM2	$J/\psi \rightarrow \phi K^+ K^-$

NODE=M013W3
NODE=M013W3**PRODUCED IN $\bar{p}p$ ANNIHILATION**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
79 ± 8	22 AMSLER 02	CBAR	$0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
128 ± 20	23 ANISOVICH 09	RVUE	$0.0 \bar{p}p, \pi N$
76 ± 6	AMSLER 06	CBAR	$0.9 \bar{p}p \rightarrow K^+ K^- \pi^0$

OCCUR=2

NODE=M013W9
NODE=M013W9**CENTRAL PRODUCTION**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
70±25	BARBERIS 99	OMEG	$450 pp \rightarrow p_s p_f K^+ K^-$

NODE=M013W4
NODE=M013W4**PRODUCED IN $e p$ COLLISIONS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
83 ± 9 ± 4		24 CHEKANOV 08	ZEUS	$e p \rightarrow K_S^0 K_S^0 X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
50 ± 34	84	25 CHEKANOV 04	ZEUS	$e p \rightarrow K_S^0 K_S^0 X$

NODE=M013W10
NODE=M013W10

13 From a partial-wave analysis of data using a K-matrix formalism with 5 poles.

14 CHABAUD 81 is a reanalysis of PAWLICKI 77 data.

15 From an amplitude analysis where the $f_2'(1525)$ width and elasticity are in complete disagreement with the values obtained from $K\bar{K}$ channel, making the solution dubious.16 From a fit to the D with $f_2(1270)-f_2'(1525)$ interference. Mass fixed at 1516 MeV.

17 Systematic errors not estimated.

18 Supersedes ACCIARRI 95J.

19 From an analysis ignoring interference with $f_0(1710)$.

20 From analysis of L3 data at 91 and 183–209 GeV.

21 From an analysis including interference with $f_0(1710)$.

22 T-matrix pole.

23 4-poles, 5-channel K matrix fit.

24 In the SU(3) based model with a specific interference pattern of the $f_2(1270)$, $a_2^0(1320)$, and $f_2'(1525)$ mesons incoherently added to the $f_0(1710)$ and non-resonant background.

25 Systematic errors not estimated.

NODE=M013W;LINKAGE=L
NODE=M013W;LINKAGE=D
NODE=M013W;LINKAGE=NNODE=M013W;LINKAGE=M
NODE=M013W2;LINKAGE=SK
NODE=M013W;LINKAGE=HA
NODE=M013W;LINKAGE=F1
NODE=M013W3;LINKAGE=SC
NODE=M013W;LINKAGE=F2
NODE=M013W;LINKAGE=TT
NODE=M013W9;LINKAGE=AN
NODE=M013W10;LINKAGE=HE

NODE=M013W10;LINKAGE=CH

NODE=M013215;NODE=M013

Mode	Fraction (Γ_i/Γ)
Γ_1	$(88.7 \pm 2.2) \%$
Γ_2	$(10.4 \pm 2.2) \%$
Γ_3	$(8.2 \pm 1.5) \times 10^{-3}$
Γ_4	$K\bar{K}^*(892) + c.c.$
Γ_5	$\pi K\bar{K}$
Γ_6	$\pi\pi\eta$
Γ_7	$\pi^+ \pi^- \pi^+ \pi^-$
Γ_8	$(1.11 \pm 0.14) \times 10^{-6}$

DESIG=2
DESIG=4
DESIG=1
DESIG=3
DESIG=6
DESIG=5
DESIG=7
DESIG=8

CONSTRAINED FIT INFORMATION

An overall fit to the total width, 2 partial widths, a combination of partial widths obtained from integrated cross sections, and 3 branching ratios uses 16 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 14.0$ for 12 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	-100			
x_3	-6	-1		
x_8	-6	6	1	
Γ	-23	23	-1	-55
	x_1	x_2	x_3	x_8

Mode	Rate (MeV)	
$\Gamma_1 K\bar{K}$	65 ± 5	DESIG=2
$\Gamma_2 \eta\eta$	7.6 ± 1.8	DESIG=4
$\Gamma_3 \pi\pi$	0.60 ± 0.12	DESIG=1
$\Gamma_8 \gamma\gamma$	(8.1 ± 0.9) $\times 10^{-5}$	DESIG=8

$f'_2(1525)$ PARTIAL WIDTHS

$\Gamma(K\bar{K})$	Γ_1
VALUE (MeV)	DOCUMENT ID TECHN COMMENT

65 $^{+5}_{-4}$ OUR FIT

63 $^{+6}_{-5}$ 26 LONGACRE 86 MPS 22 $\pi^- p \rightarrow K_S^0 K_S^0 n$

$\Gamma(\eta\eta)$	Γ_2
VALUE (MeV)	DOCUMENT ID TECHN COMMENT

7.6 ± 1.8 OUR FIT

• • • We do not use the following data for averages, fits, limits, etc. • • •

5.0 \pm 0.8 870 27 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$
 24 \pm 3 26 LONGACRE 86 MPS 22 $\pi^- p \rightarrow K_S^0 K_S^0 n$

$\Gamma(\pi\pi)$	Γ_3
VALUE (MeV)	DOCUMENT ID TECHN COMMENT

0.60 ± 0.12 OUR FIT

1.4 $^{+1.0}_{-0.5}$ 26 LONGACRE 86 MPS 22 $\pi^- p \rightarrow K_S^0 K_S^0 n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.2 \pm 1.0 870 27 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\gamma\gamma)$	Γ_8
VALUE (keV)	DOCUMENT ID TECHN COMMENT

0.081 ± 0.009 OUR FIT

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.13 \pm 0.03 870 27 SCHEGELSKY 06A RVUE $\gamma\gamma \rightarrow K_S^0 K_S^0$

26 From a partial-wave analysis of data using a K-matrix formalism with 5 poles.

27 From analysis of L3 data at 91 and 183–209 GeV, using $\Gamma(f'_2(1525) \rightarrow K\bar{K}) = 68$ MeV and SU(3) relations.

NODE=M013220

NODE=M013W6
NODE=M013W6

NODE=M013W7
NODE=M013W7

NODE=M013W5
NODE=M013W5

NODE=M013W8
NODE=M013W8

NODE=M013PW;LINKAGE=L
NODE=M013W8;LINKAGE=SC

$f'_2(1525) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_1\Gamma_8/\Gamma$
<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.072 ± 0.007 OUR FIT					NODE=M013G1
0.072 ± 0.007 OUR AVERAGE					NODE=M013G1
0.0564 ± 0.0048 ± 0.0116	ABE	04	BELL	10.6 $e^+ e^- \rightarrow e^+ e^- K^+ K^-$	
0.076 ± 0.006 ± 0.011	331	28 ACCIARRI	01H L3	$e^+ e^- \rightarrow e^+ e^- K_S^0 K_S^0$	
0.067 ± 0.008 ± 0.015		29 ALBRECHT	90G ARG	$e^+ e^- \rightarrow e^+ e^- K^+ K^-$	
0.11 ± 0.03 ± 0.02		BEHREND	89C CELL	$e^+ e^- \rightarrow e^+ e^- K_S^0 K_S^0$	
0.10 ± 0.04 ± 0.03		BERGER	88 PLUT	$e^+ e^- \rightarrow e^+ e^- K_S^0 K_S^0$	
0.12 ± 0.07 ± 0.04	29 AIHARA	86B TPC		$e^+ e^- \rightarrow e^+ e^- K^+ K^-$	
0.11 ± 0.02 ± 0.04	29 ALTHOFF	83 TASS		$e^+ e^- \rightarrow e^+ e^- K\bar{K}$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0314 ± 0.0050 ± 0.0077	30 ALBRECHT	90G ARG		$e^+ e^- \rightarrow e^+ e^- K^+ K^-$	OCCUR=2
28 Supersedes ACCIARRI 95J. From analysis of L3 data at 91 and 183–209 GeV,					
29 Using an incoherent background.					
30 Using a coherent background.					

 $f'_2(1525) \text{ BRANCHING RATIOS}$

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$				Γ_2/Γ
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen		UEHARA	10A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \eta\eta$
0.10 ± 0.03		31 PROKOSHKIN	91 GAM4	$300 \pi^- p \rightarrow \pi^- p\eta\eta$
31 Combining results of GAM4 with those of WA76 on $K\bar{K}$ central production and results of CBAL, MRK3 and DM2 on $J/\psi \rightarrow \gamma\eta\eta$.				

$\Gamma(\eta\eta)/\Gamma(K\bar{K})$				Γ_2/Γ_1	
<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.118 ± 0.028 OUR FIT					
0.115 ± 0.028 OUR AVERAGE					
0.119 ± 0.015 ± 0.036	61	32 BINON	07 GAMS	32.5 $K^- p \rightarrow \eta\eta(\Lambda/\Sigma^0)$	
0.11 ± 0.04		33 PROKOSHKIN	91 GAM4	$300 \pi^- p \rightarrow \pi^- p\eta\eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.14	90	BARBERIS	00E	$450 p p \rightarrow p_f \eta\eta p_s$	
< 0.50		BARNES	67 HBC	$4.6, 5.0 K^- p$	
32 Using the compilation of the cross sections for $f'_2(1525)$ production in $K^- p$ collisions from ASTON 88D.					
33 Combining results of GAM4 with those of WA76 on $K\bar{K}$ central production and results of CBAL, MRK3 and DM2 on $J/\psi \rightarrow \gamma\eta\eta$.					

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$				Γ_3/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0082 ± 0.0016 OUR FIT				
0.0075 ± 0.0016 OUR AVERAGE				
0.007 ± 0.002		COSTA...	80 OMEG	$10 \pi^- p \rightarrow K^+ K^- n$
0.027 ± 0.071		34 GORLICH	80 ASPK	$17, 18 \pi^- p \rightarrow \pi^+ \pi^- n$
0.0075 ± 0.0025		34, 35 MARTIN	79 RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 0.06	95	AGUILAR...	81B HBC	$4.2 K^- p \rightarrow \Lambda K^+ K^-$
0.19 ± 0.03		CORDEN	79 OMEG	$12-15 \pi^- p \rightarrow \pi^+ \pi^- n$
< 0.045	95	BARREIRO	77 HBC	$4.15 K^- p \rightarrow \Lambda K_S^0 K_S^0$
0.012 ± 0.004		34 PAWLICKI	77 SPEC	$6 \pi N \rightarrow K^+ K^- N$
< 0.063	90	BRANDENB...	76C ASPK	$13 K^- p \rightarrow K^+ K^- (\Lambda, \Sigma)$
< 0.0086		34 BEUSCH	75B OSPK	$8.9 \pi^- p \rightarrow K^0 \bar{K}^0 n$
34 Assuming that the $f'_2(1525)$ is produced by an one-pion exchange production mechanism.				
35 MARTIN 79 uses the PAWLICKI 77 data with different input value of the $f'_2(1525) \rightarrow K\bar{K}$ branching ratio.				

NODE=M013223

NODE=M013G1

NODE=M013G1

OCCUR=2

NODE=M013G;LINKAGE=HA

NODE=M013G1;LINKAGE=A

NODE=M013G1;LINKAGE=B

NODE=M013225

NODE=M013R8

NODE=M013R8

NODE=M013R8;LINKAGE=B

NODE=M013R3

NODE=M013R3

NODE=M013R3;LINKAGE=BI

NODE=M013R3;LINKAGE=B

NODE=M013R1

NODE=M013R1

NODE=M013R1;LINKAGE=C

NODE=M013R1;LINKAGE=D

$\Gamma(\pi\pi)/\Gamma(K\bar{K})$ VALUE**0.0092±0.0018 OUR FIT****0.075 ± 0.035**DOCUMENT IDTECNCOMMENT

AUGUSTIN

87

DM2

 $J/\psi \rightarrow \gamma\pi^+\pi^-$ Γ_3/Γ_1

NODE=M013R7

NODE=M013R7

 $[\Gamma(K\bar{K}^*(892)+c.c.) + \Gamma(\pi K\bar{K})]/\Gamma(K\bar{K})$ VALUECL%DOCUMENT IDTECNCOMMENT $(\Gamma_4+\Gamma_5)/\Gamma_1$

NODE=M013R5

NODE=M013R5

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.35 95 AGUILAR-... 72B HBC 3.9,4.6 $K^- p$

<0.4 67 AMMAR 67 HBC

 $\Gamma(\pi\pi\eta)/\Gamma(K\bar{K})$ VALUECL%DOCUMENT IDTECNCOMMENT Γ_6/Γ_1

NODE=M013R4

NODE=M013R4

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.41 95 AGUILAR-... 72B HBC 3.9,4.6 $K^- p$

<0.3 67 AMMAR 67 HBC

 $\Gamma(\pi^+\pi^+\pi^-\pi^-)/\Gamma(K\bar{K})$ VALUECL%DOCUMENT IDTECNCOMMENT Γ_7/Γ_1

NODE=M013R6

NODE=M013R6

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.32 95 AGUILAR-... 72B HBC 3.9,4.6 $K^- p$ $f'_2(1525)$ REFERENCES

UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=53641
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	(ZEUS Collab.)	REFID=52719
CHEKANOV	08	PRL 101 112003	S. Chekanov <i>et al.</i>	(BES Collab.)	REFID=52275
BINON	07	PAN 70 1713	F. Binon <i>et al.</i>	(GAMS Collab.)	REFID=52057
		Translated from YAF 70 1758.			
AMSLER	06	PL B639 165	C. Amsler <i>et al.</i>	(CBAR Collab.)	REFID=51136
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>	(WA 102 Collab.)	REFID=51185
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(Omega Expt.)	REFID=50450
ABE	04	EPJ C32 323	K. Abe <i>et al.</i>	(BES Collab.)	REFID=49650
CHEKANOV	04	PL B578 33	S. Chekanov <i>et al.</i>	(DELPHI Collab.)	REFID=49672
BAI	03G	PR D68 052003	J.Z. Bai <i>et al.</i>	(L3 Collab.)	REFID=49580
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>	(TETE) JP	REFID=49423
		Translated from YAF 66 860.			
AMSLER	02	EPJ C23 29	C. Amsler <i>et al.</i>	(WA 102 Collab.)	REFID=48580
ACCIARRI	01H	PL B501 173	M. Acciarri <i>et al.</i>	(WA 102 Collab.)	REFID=48321
BARBERIS	00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=47961
BARBERIS	99	PL B453 305	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=46921
BARKOV	99	JETPL 70 248	B.P. Barkov <i>et al.</i>	(WA 102 Collab.)	REFID=47379
		Translated from ZETFP 70 242.			
ABREU	96C	PL B379 309	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=44671
BAI	96C	PRL 77 3959	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=45169
ACCIARRI	95J	PL B363 118	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=44615
PROKOSHKIN	91	SPD 36 155	Y.D. Prokoshkin	(GAM2, GAM4 Collab.)	REFID=41719
		Translated from DANS 316 900.			
ALBRECHT	90G	ZPHY C48 183	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=41374
PDG	90	PL B239 1	J.J. Hernandez <i>et al.</i>	(IFIC, BOST, CIT+)	REFID=40744
BEHREND	89C	ZPHY C43 91	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=40915
ASTON	88D	NP B301 525	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=40330
AUGUSTIN	88	PRL 60 2238	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=40574
BERGER	88	ZPHY C37 329	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=40566
FALVARD	88	PR D38 2706	A. Falvard <i>et al.</i>	(CLER, FRAS, LALO+)	REFID=40576
AUGUSTIN	87	ZPHY C36 369	J.E. Augustin <i>et al.</i>	(LALO, CLER, FRAS+)	REFID=40268
BALTRUSAIT...	87	PR D35 2077	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=40010
AIHARA	86B	PR D 57 404	H. Aihsra <i>et al.</i>	(TPC-2 γ Collab.)	REFID=20764
BOLONKIN	86	SJNP 43 776	B.V. Bolonkin <i>et al.</i>	(ITEP) JP	REFID=44646
		Translated from YAF 43 1211.			
LONGACRE	86	PL B177 223	R.S. Longacre <i>et al.</i>	(BNL, BRAN, CUNY+)	REFID=20768
ALTHOFF	83	PL 121B 216	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=21408
ARMSTRONG	83B	NP B224 193	T.A. Armstrong <i>et al.</i>	(BARI, BIRM, CERN+)	REFID=20558
AGUILAR-...	81B	ZPHY C8 313	M. Aguilar-Benitez <i>et al.</i>	(CERN, CDEF+)	REFID=21104
ALHARRAN	81	NP B191 26	S. Al-Harran <i>et al.</i>	(BIRM, CERN, GLAS+)	REFID=21403
CHABAUD	81	APP B12 575	V. Chabaud <i>et al.</i>	(CERN, CRAC, MPIM)	REFID=20742
COSTA...	80	NP B175 402	G. Costa de Beauregard <i>et al.</i>	(BARI, BONN+)	REFID=20737
GORLICH	80	NP B174 16	L. Gorlich <i>et al.</i>	(CRAC, MPIM, CERN+)	REFID=20738
CORDEN	79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+) JP	REFID=20374
MARTIN	79	NP B158 520	A.D. Martin, E.N. Ozmutlu	(DURH)	REFID=20377
POLYCHRO...	79	PR D19 1317	V.A. Polychronakos <i>et al.</i>	(NDAM, ANL)	REFID=20378
BARREIRO	77	NP B121 237	F. Barreiro <i>et al.</i>	(CERN, AMST, NIJM+)	REFID=21392
EVANGELIS...	77	NP B127 384	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)	REFID=20540
PAWLICKI	77	PR D15 3196	A.J. Pawlicki <i>et al.</i>	(ANL) IUPC	REFID=20367
BRANDENB...	76C	NP B104 413	G.W. Brandenburg <i>et al.</i>	(SLAC)	REFID=20225
BEUSCH	75B	PL 60B 101	W. Beusch <i>et al.</i>	(CERN, ETH)	REFID=21390
AGUILAR-...	72B	PR D 6 29	M. Aguilar-Benitez <i>et al.</i>	(BNL)	REFID=20205
AMMAR	67	PRL 19 1071	R. Ammar <i>et al.</i>	(NWES, ANL) JP	REFID=21382
BARNES	67	PRL 19 964	V.E. Barnes <i>et al.</i>	(BNL, SYRA) IUPC	REFID=21383
CRENNELL	66	PRL 16 1025	D.J. Crennell <i>et al.</i>	(BNL) I	REFID=20317

NODE=M123

 $f_2(1565)$ $I^G(J^{PC}) = 0^+(2^{++})$

OMITTED FROM SUMMARY TABLE

Seen mostly in antinucleon-nucleon annihilation. Needs confirmation
in other channels.

NODE=M123

 $f_2(1565)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1562±13 OUR AVERAGE	Error includes scale factor of 2.1. See the ideogram below.		
1590±10	1 AMELIN 06	VES	$36 \pi^- p \rightarrow \omega\omega n$
1552±13	2 AMSLER 02	CBAR	$0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$
1550±10±20	AMELIN 00	VES	$37 \pi^- p \rightarrow \eta\pi^+\pi^-\pi^-$
1575±18	BERTIN 98	OBLX	$0.05-0.405 \bar{n}p \rightarrow \pi^+\pi^+\pi^-$
1507±15	2 BERTIN 97C	OBLX	$0.0 \bar{p}p \rightarrow \pi^+\pi^-\pi^0$
1565±20	MAY 90	ASTE	$0.0 \bar{p}p \rightarrow \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1560±15	3 ANISOVICH 09	RVUE	$0.0 \bar{p}p, \pi N$
1598±11± 9	BAKER 99B	SPEC	$0 \bar{p}p \rightarrow \omega\omega\pi^0$
1534±20	4 ABELE 96C	RVUE	Compilation
~1552	5 AMSLER 95D	CBAR	$0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta\eta, \pi^0 \pi^0 \eta$
1598±72	BALOSHIN 95	SPEC	$40 \pi^- C \rightarrow K_S^0 K_S^0 X$
1566 ⁺⁸⁰ ₋₅₀	6 ANISOVICH 94	CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0, \eta\eta\pi^0$
1502± 9	ADAMO 93	OBLX	$\bar{n}p \rightarrow \pi^+\pi^+\pi^-$
1488±10	7 ARMSTRONG 93C	E760	$\bar{p}p \rightarrow \pi^0 \eta\eta \rightarrow 6\gamma$
1508±10	7 ARMSTRONG 93D	E760	$\bar{p}p \rightarrow 3\pi^0 \rightarrow 6\gamma$
1525±10	7 ARMSTRONG 93D	E760	$\bar{p}p \rightarrow \eta\pi^0 \pi^0 \rightarrow 6\gamma$
~1504	8 WEIDENAUER 93	ASTE	$0.0 \bar{p}N \rightarrow 3\pi^- 2\pi^+$
1540±15	7 ADAMO 92	OBLX	$\bar{n}p \rightarrow \pi^+\pi^+\pi^-$
1515±10	9 AKER 91	CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0$
1477± 5	BRIDGES 86C	DBC	$0.0 \bar{p}N \rightarrow 3\pi^- 2\pi^+$

1 Supersedes the $\omega\omega$ state of BELADIDZE 92B earlier assigned to the $f_2(1640)$.

2 T-matrix pole.

3 On sheet II in a two-pole solution.

4 T-matrix pole, large coupling to $\rho\rho$ and $\omega\omega$, could be $f_2(1640)$.

5 Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

6 From a simultaneous analysis of the annihilations $\bar{p}p \rightarrow 3\pi^0, \pi^0 \eta\eta$ including AKER 91 data.7 J^P not determined, could be partly $f_0(1500)$.8 J^P not determined.

9 Superseded by AMSLER 95B.

OCCUR=2

NODE=M123M;LINKAGE=AM

NODE=M123M;LINKAGE=G

NODE=M123M;LINKAGE=AN

NODE=M123M;LINKAGE=AA

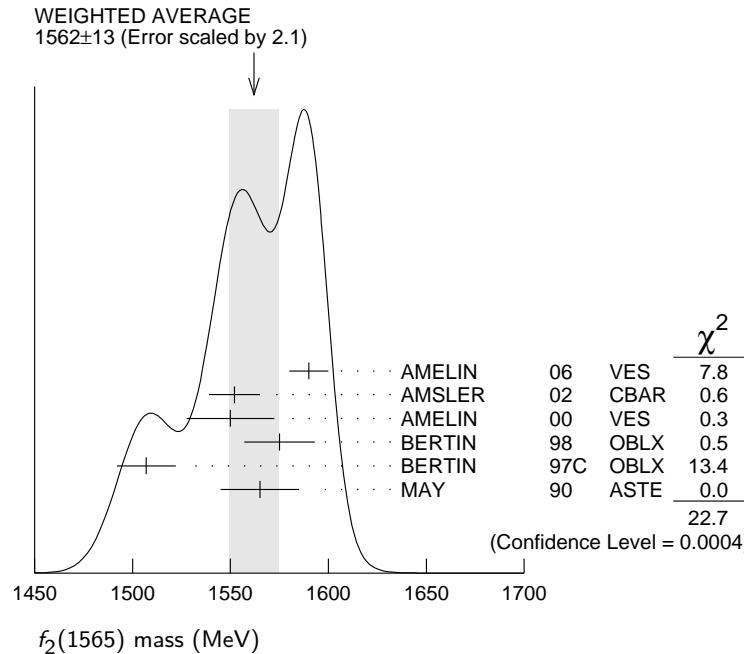
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NODE=M123M;LINKAGE=C

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NODE=M123M;LINKAGE=F

NODE=M123M;LINKAGE=BA



f₂(1565) WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
134± 8 OUR AVERAGE			
140± 11	10 AMELIN	06 VES	$36 \pi^- p \rightarrow \omega\omega n$
113± 23	11 AMSLER	02 CBAR	$0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$
130± 20±40	AMELIN	00 VES	$37 \pi^- p \rightarrow \eta\pi^+\pi^- n$
119± 24	BERTIN	98 OBLX	$0.05-0.405 \bar{p}p \rightarrow \pi^+\pi^+\pi^-$
130± 20	11 BERTIN	97C OBLX	$0.0 \bar{p}p \rightarrow \pi^+\pi^-\pi^0$
170± 40	MAY	90 ASTE	$0.0 \bar{p}p \rightarrow \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
280± 40	12 ANISOVICH	09 RVUE	$0.0 \bar{p}p, \pi N$
180± 60	13 ABELE	96C RVUE	Compilation
~142	14 AMSLER	95D CBAR	$0.0 \bar{p}p \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta\eta, \pi^0 \pi^0 \eta$
263±101	BALOSHIN	95 SPEC	$40 \pi^- C \rightarrow K_S^0 K_S^0 X$
166 ^{+ 80} _{- 20}	15 ANISOVICH	94 CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0, \eta\eta\pi^0$
130± 10	16 ADAMO	93 OBLX	$\bar{p}p \rightarrow \pi^+\pi^+\pi^-$
148± 27	17 ARMSTRONG	93C E760	$\bar{p}p \rightarrow \pi^0 \eta\eta \rightarrow 6\gamma$
103± 15	17 ARMSTRONG	93D E760	$\bar{p}p \rightarrow 3\pi^0 \rightarrow 6\gamma$
111± 10	17 ARMSTRONG	93D E760	$\bar{p}p \rightarrow \eta\pi^0 \pi^0 \rightarrow 6\gamma$
~206	18 WEIDENAUER	93 ASTE	$0.0 \bar{p}N \rightarrow 3\pi^- 2\pi^+$
132± 37	17 ADAMO	92 OBLX	$\bar{p}p \rightarrow \pi^+\pi^+\pi^-$
120± 10	19 AKER	91 CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0$
116± 9	BRIDGES	86C DBC	$0.0 \bar{p}N \rightarrow 3\pi^- 2\pi^+$

10 Supersedes the $\omega\omega$ state of BELADIDZE 92B earlier assigned to the f₂(1640).

11 T-matrix pole.

12 On sheet II in a two-pole solution.

13 T-matrix pole, large coupling to $\rho\rho$ and $\omega\omega$, could be f₂(1640).

14 Coupled-channel analysis of AMSLER 95B, AMSLER 95C, and AMSLER 94D.

15 From a simultaneous analysis of the annihilations $\bar{p}p \rightarrow 3\pi^0, \pi^0 \eta\eta$ including AKER 91 data.

16 Supersedes ADAMO 92.

17 J^P not determined, could be partly f₀(1500).18 J^P not determined.

19 Superseded by AMSLER 95B.

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NODE=M123W3
NODE=M123W3NODE=M123W1
NODE=M123W1**f₂(1565) DECAY MODES**

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	seen
$\Gamma_2 \pi^+ \pi^-$	seen
$\Gamma_3 \pi^0 \pi^0$	seen
$\Gamma_4 \rho^0 \rho^0$	seen
$\Gamma_5 2\pi^+ 2\pi^-$	seen
$\Gamma_6 \eta\eta$	seen
$\Gamma_7 a_2(1320)\pi$	
$\Gamma_8 \omega\omega$	seen
$\Gamma_9 K\bar{K}$	
$\Gamma_{10} \gamma\gamma$	

f₂(1565) PARTIAL WIDTHS

$\Gamma(\eta\eta)$	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.2±0.3	870	20 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(K\bar{K})$	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.0±1.0	870	20 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\gamma\gamma)$

<u>VALUE</u> (keV)	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{10}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.70±0.14	870	20 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$	NODE=M123W2 NODE=M123W2
20 From analysis of L3 data at 91 and 183–209 GeV, using $f_2(1565)$ mass of 1570 MeV, width of 160 MeV, $\Gamma(\pi\pi) = 25$ MeV, and SU(3) relations.					

 $f_2(1565)$ BRANCHING RATIOS $\Gamma(\pi\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_1/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	BAKER	99B	SPEC	$0 \bar{p}p \rightarrow \omega\omega\pi^0$

 $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_2/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	BERTIN	98	OBLX	$0.05\text{--}0.405 \bar{p}p \rightarrow \pi^+\pi^+\pi^-$
not seen	21 ANISOVICH	94B	RVUE	$\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
seen	MAY	89	ASTE	$\bar{p}p \rightarrow \pi^+\pi^-\pi^0$

21 ANISOVICH 94B is from a reanalysis of MAY 90.

 $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_3/Γ
seen	AMSLER	95B	CBAR	$0.0 \bar{p}p \rightarrow 3\pi^0$

 $\Gamma(\pi^+\pi^-)/\Gamma(\rho^0\rho^0)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_2/Γ_4
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.042±0.013	BRIDGES	86B	DBC	$\bar{p}N \rightarrow 3\pi^- 2\pi^+$

 $\Gamma(\eta\eta)/\Gamma(\pi^0\pi^0)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_6/Γ_3
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.024±0.005±0.012	22 ARMSTRONG	93C	E760	$\bar{p}p \rightarrow \pi^0\eta\eta \rightarrow 6\gamma$

22 J^P not determined, could be partly $f_0(1500)$. $\Gamma(\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_8/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	BAKER	99B	SPEC	$0 \bar{p}p \rightarrow \omega\omega\pi^0$

 $f_2(1565)$ REFERENCES

ANISOVICH 09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev		
AMELIN 06	PAN 69 690	D.V. Amelin <i>et al.</i>	(VES Collab.)	
SCHEGELSKY 06A	EPJ A27 207	Translated from YAF 69 715. V.A. Schegelsky <i>et al.</i>		
AMSLER 02	EPJ C23 29	C. Amsler <i>et al.</i>		
AMELIN 00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)	
BAKER 99B	PL B467 147	C.A. Baker <i>et al.</i>		
BERTIN 98	PR D57 55	A. Bertin <i>et al.</i>	(OBELIX Collab.)	
BERTIN 97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)	
ABELE 96C	NP A609 562	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	
AMSLER 95B	PL B342 433	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	
AMSLER 95C	PL B353 571	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	
AMSLER 95D	PL B355 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	
BALOSHIN 95	PAN 58 46	O.N. Baloshin <i>et al.</i>	(ITEP)	
		Translated from YAF 58 50.		
AMSLER 94D	PL B333 277	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)	
ANISOVICH 94	PL B323 233	V.V. Anisovich <i>et al.</i>	(Crystal Barrel Collab.)	
ANISOVICH 94B	PR D50 1972	V.V. Anisovich <i>et al.</i>	(LOQM)	
ADAMO 93	NP A558 13C	A. Adamo <i>et al.</i>	(OBELIX Collab.)	
ARMSTRONG 93C	PL B307 394	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	
ARMSTRONG 93D	PL B307 399	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	
WEIDENAUER 93	ZPHY C59 387	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)	
ADAMO 92	PL B287 368	A. Adamo <i>et al.</i>	(OBELIX Collab.)	
BELADIDZE 92B	ZPHY C54 367	G.M. Beladidze <i>et al.</i>	(VES Collab.)	
AKER 91	PL B260 249	E. Aker <i>et al.</i>	(Crystal Barrel Collab.)	
MAY 90	ZPHY C46 203	B. May <i>et al.</i>	(ASTERIX Collab.)	
MAY 89	PL B225 450	B. May <i>et al.</i>	(ASTERIX Collab.) IJP	
BRIDGES 86B	PRL 56 215	D.L. Bridges <i>et al.</i>	(SYRA, CASE)	
BRIDGES 86C	PRL 57 1534	D.L. Bridges <i>et al.</i>	(SYRA)	

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REFID=41587

REFID=41365

REFID=40921

REFID=21376

REFID=21377

$\rho(1570)$ $I^G(J^P C) = 1^+(1^- -)$

OMITTED FROM SUMMARY TABLE

May be an OZI-violating decay mode of $\rho(1700)$. See our mini-review under the $\rho(1700)$.

 $\rho(1570)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1570±36±62	54	1 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi \pi^0 \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

1480±40 2 BITYUKOV 87 SPEC $32.5 \pi^- p \rightarrow \phi \pi^0 n$

1 From the fit with two resonances.

2 Systematic errors not estimated.

 $\rho(1570)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
144±75±43	54	3 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi \pi^0 \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
130±60	4 BITYUKOV	87	SPEC	$32.5 \pi^- p \rightarrow \phi \pi^0 n$

3 From the fit with two resonances.

4 Systematic errors not estimated.

 $\rho(1570)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	
$\Gamma_2 \phi \pi$	not seen
$\Gamma_3 \omega \pi$	

 $\rho(1570) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\phi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_1/\Gamma$
3.5±0.9±0.3	5 AUBERT 08S BABR $10.6 e^+ e^- \rightarrow \phi \pi^0 \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •	

<70 90 6 AULCHENKO 87B ND $e^+ e^- \rightarrow K_S^0 K_L^0 \pi^0$

5 From the fit with two resonances.

6 Using mass and width of BITYUKOV 87.

 $\rho(1570)$ BRANCHING RATIOS

$\Gamma(\phi\pi)/\Gamma_{\text{total}}$	Γ_2/Γ
not seen	ABELE 97H CBAR $\bar{p}p \rightarrow K_L^0 K_S^0 \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •	

<0.01 7 DONNACHIE 91 RVUE

7 Using data from BISELLO 91B, DOLINSKY 86, and ALBRECHT 87L.

$\Gamma(\phi\pi)/\Gamma(\omega\pi)$	Γ_2/Γ_3
• • • We do not use the following data for averages, fits, limits, etc. • • •	

>0.5 95 BITYUKOV 87 SPEC $32.5 \pi^- p \rightarrow \phi \pi^0 n$ **$\rho(1570)$ REFERENCES**

AUBERT	08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
ABELE	97H	PL B415 280	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
BISELLO	91B	NPBPS B21 111	D. Bisello	(DM2 Collab.)
DONNACHIE	91	ZPHY C51 689	A. Donnachie, A.B. Clegg	(MCHS, LANC)
ALBRECHT	87L	PL B185 223	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
AULCHENKO	87B	JETPL 45 145	V.M. Aulchenko <i>et al.</i>	(NOVO)
BITYUKOV	87	Translated from ZETFP 45 118.	S.I. Bityukov <i>et al.</i>	(SERP)
DOLINSKY	86	PL B188 383	S.I. Dolinsky <i>et al.</i>	(NOVO)

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$h_1(1595)$ $I^G(J^{PC}) = 0^-(1^{+-})$

OMITTED FROM SUMMARY TABLE

Seen in a partial-wave analysis of the $\omega\eta$ system produced in the reaction $\pi^- p \rightarrow \omega\eta n$ at 18 GeV/c.

$h_1(1595)$ MASS				
VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
$1594 \pm 15^{+10}_{-60}$	EUGENIO 01	SPEC	$18 \pi^- p \rightarrow \omega\eta n$	NODE=M166

$h_1(1595)$ WIDTH				
VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
$384 \pm 60^{+70}_{-100}$	EUGENIO 01	SPEC	$18 \pi^- p \rightarrow \omega\eta n$	NODE=M166W

$h_1(1595)$ DECAY MODES				
Mode	Fraction (Γ_i/Γ)			
$\Gamma_1 \quad \omega\eta$	seen			

$h_1(1595)$ REFERENCES				
EUGENIO 01 PL B497 190	P. Eugenio <i>et al.</i>			

$\pi_1(1600)$				
$I^G(J^{PC}) = 1^-(1^{-+})$				

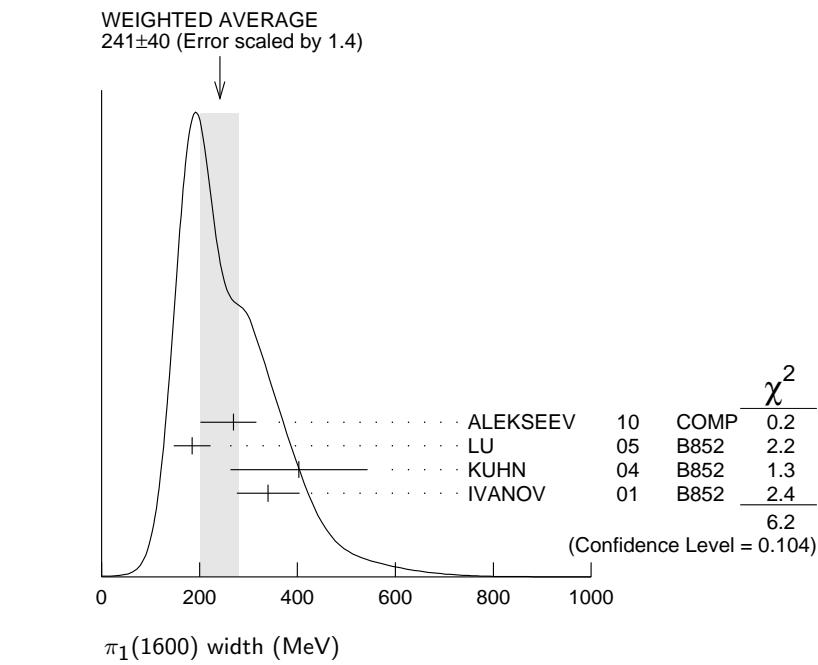
$\pi_1(1600)$ MASS				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$1662 \pm 8^{+8}_{-9}$ OUR AVERAGE				
$1660 \pm 10^{+0}_{-64}$	420k	ALEKSEEV 10	COMP	$190 \pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
$1664 \pm 8 \pm 10$	145k	1 LU 05	B852	$18 \pi^- p \rightarrow \omega \pi^- \pi^0 p$
$1709 \pm 24 \pm 41$	69k	2 KUHN 04	B852	$18 \pi^- p \rightarrow \eta \pi^+ \pi^- \pi^- p$
$1597 \pm 10^{+45}_{-10}$		2 IVANOV 01	B852	$18 \pi^- p \rightarrow \eta' \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1593 \pm 8^{+29}_{-47}$	2,3 ADAMS 98B	B852	18.3	$\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$
1 May be a different state: natural and unnatural parity exchanges.				
2 Natural parity exchange.				
3 Superseded by DZIERBA 06 excluding this state in a more refined PWA analysis, with 2.6 M events of $\pi^- p \rightarrow \pi^- \pi^- \pi^+ p$ and 3 M events of $\pi^- p \rightarrow \pi^- \pi^0 \pi^0 p$ of E852 data.				

$\pi_1(1600)$ WIDTH				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
241 ± 40 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below.
$269 \pm 21^{+42}_{-64}$	420k	ALEKSEEV 10	COMP	$190 \pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
$185 \pm 25 \pm 28$	145k	4 LU 05	B852	$18 \pi^- p \rightarrow \omega \pi^- \pi^0 p$
$403 \pm 80 \pm 115$	69k	5 KUHN 04	B852	$18 \pi^- p \rightarrow \eta \pi^+ \pi^- \pi^- p$
$340 \pm 40 \pm 50$		5 IVANOV 01	B852	$18 \pi^- p \rightarrow \eta' \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$168 \pm 20^{+150}_{-12}$	5,6 ADAMS 98B	B852	18.3	$\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

⁴ May be a different state: natural and unnatural parity exchanges.

⁵ Natural parity exchange.

⁶ Superseded by DZIERBA 06 excluding this state in a more refined PWA analysis, with 2.6 M events of $\pi^- p \rightarrow \pi^- \pi^- \pi^+ p$ and 3 M events of $\pi^- p \rightarrow \pi^- \pi^0 \pi^0 p$ of E852 data.



$\pi_1(1600)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	not seen
$\Gamma_2 \rho^0\pi^-$	not seen
$\Gamma_3 f_2(1270)\pi^-$	not seen
$\Gamma_4 b_1(1235)\pi$	seen
$\Gamma_5 \eta'(958)\pi^-$	seen
$\Gamma_6 f_1(1285)\pi$	seen

$\pi_1(1600)$ BRANCHING RATIOS

$\Gamma(\rho^0\pi^-)/\Gamma_{\text{total}}$	Γ_2/Γ
VALUE	DOCUMENT ID TECN COMMENT
not seen	NOZAR 09 CLAS $\gamma p \rightarrow 2\pi^+ \pi^- n$
not seen	7 DZIERBA 06 B852 $18 \pi^- p$

⁷ From the PWA analysis of 2.6 M $\pi^- p \rightarrow \pi^- \pi^- \pi^+ p$ and 3 M events of $\pi^- p \rightarrow \pi^- \pi^0 \pi^0 p$ of E852 data. Supersedes ADAMS 98B.

$\Gamma(f_2(1270)\pi^-)/\Gamma_{\text{total}}$	Γ_3/Γ
VALUE	DOCUMENT ID TECN COMMENT
not seen	8 DZIERBA 06 B852 $18 \pi^- p$

⁸ From the PWA analysis of 2.6 M $\pi^- p \rightarrow \pi^- \pi^- \pi^+ p$ and 3 M events of $\pi^- p \rightarrow \pi^- \pi^0 \pi^0 p$ of E852 data. Supersedes CHUNG 02.

$\Gamma(b_1(1235)\pi)/\Gamma_{\text{total}}$	Γ_4/Γ
VALUE	EVTS DOCUMENT ID TECN COMMENT
seen	35280 9 BAKER 03 SPEC $\bar{p}p \rightarrow \omega \pi^+ \pi^- \pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

seen 145k LU 05 B852 $18 \pi^- p \rightarrow \omega \pi^- \pi^0 p$

${}^9 B((b_1\pi)_{D-\text{wave}})/B((b_1\pi)_{S-\text{wave}})=0.3 \pm 0.1.$

$\Gamma(\eta'(958)\pi^-)/\Gamma_{\text{total}}$	Γ_5/Γ
VALUE	DOCUMENT ID TECN COMMENT
seen	IVANOV 01 B852 $18 \pi^- p \rightarrow \eta' \pi^- p$

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NODE=M164R4
NODE=M164R4

NODE=M164R;LINKAGE=RB

NODE=M164R2
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$\Gamma(f_1(1285)\pi)/\Gamma(\eta'(958)\pi^-)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_5
3.80±0.78	69k	10 KUHN	04 B852	$18 \pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$	
10 Using $\eta'(958)\pi$ data from IVANOV 01.					

 $\pi_1(1600)$ REFERENCES

ALEKSEEV	10	PRL 104 241803	M.G. Alekseev et al.	(COMPASS Collab.)
NOZAR	09	PRL 102 102002	M. Nozar et al.	(CLAS Collab.)
DZIERBA	06	PR D73 072001	A.R. Dzierba et al.	(BNL E852 Collab.)
LU	05	PR 94 032002	M. Lu et al.	(BNL E852 Collab.)
KUHN	04	PL B595 109	J. Kuhn et al.	(BNL E852 Collab.)
BAKER	03	PL B563 140	C.A. Baker et al.	(BNL E852 Collab.)
CHUNG	02	PR D65 072001	S.U. Chung et al.	(BNL E852 Collab.)
IVANOV	01	PRL 86 3977	E.I. Ivanov et al.	(BNL E852 Collab.)
ADAMS	98B	PRL 81 5760	G.S. Adams et al.	(BNL E852 Collab.)

 $a_1(1640)$

$I^G(J^{PC}) = 1^-(1^{++})$

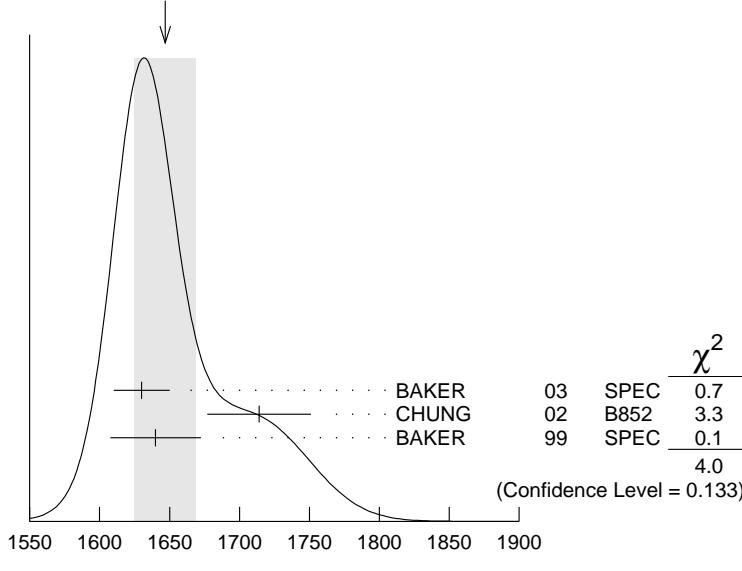
OMITTED FROM SUMMARY TABLE

Seen in the amplitude analysis of the $3\pi^0$ system produced in $\bar{p}p \rightarrow 4\pi^0$. Possibly seen in the study of the hadronic structure in decay $\tau \rightarrow 3\pi\nu_\tau$ (ABREU 98G and ASNER 00). Needs confirmation.

 $a_1(1640)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1647±22 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below.
1630±20	35280	1 BAKER	03 SPEC	$\bar{p}p \rightarrow \omega\pi^+\pi^-\pi^0$
1714± 9±36		CHUNG	02 B852	$18.3 \pi^- p \rightarrow \pi^+\pi^-\pi^- p$
1640±12±30		BAKER	99 SPEC	$1.94 \bar{p}p \rightarrow 4\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1670±90		BELLINI	85 SPEC	$40 \pi^- A \rightarrow \pi^-\pi^+\pi^- A$

WEIGHTED AVERAGE
1647±22 (Error scaled by 1.4)

 $a_1(1640)$ mass (MeV)1 Using the $a_1(1260)$ mass and width results of BOWLER 88. $a_1(1640)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
254± 27 OUR AVERAGE				Error includes scale factor of 1.1.
225± 30	35280	2 BAKER	03 SPEC	$\bar{p}p \rightarrow \omega\pi^+\pi^-\pi^0$
308± 37±62		CHUNG	02 B852	$18.3 \pi^- p \rightarrow \pi^+\pi^-\pi^- p$
300± 22±40		BAKER	99 SPEC	$1.94 \bar{p}p \rightarrow 4\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300±100		BELLINI	85 SPEC	$40 \pi^- A \rightarrow \pi^-\pi^+\pi^- A$

NODE=M164R5
NODE=M164R5

NODE=M164R;LINKAGE=KU

NODE=M164

REFID=53356
REFID=52758
REFID=51077
REFID=50459
REFID=49773
REFID=49414
REFID=48837
REFID=48317
REFID=46610

NODE=M161

NODE=M161

NODE=M161M

NODE=M161M

NODE=M161M;LINKAGE=KB

NODE=M161W

NODE=M161W

² Using the $a_1(1260)$ mass and width results of BOWLER 88.

$a_1(1640)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi\pi$	seen
$\Gamma_2 f_2(1270)\pi$	seen
$\Gamma_3 \sigma\pi$	seen
$\Gamma_4 \rho\pi S\text{-wave}$	seen
$\Gamma_5 \rho\pi D\text{-wave}$	seen
$\Gamma_6 \omega\pi\pi$	seen
$\Gamma_7 f_1(1285)\pi$	seen
$\Gamma_8 a_1(1260)\eta$	not seen

$a_1(1640)$ BRANCHING RATIOS

$\Gamma(f_2(1270)\pi)/\Gamma(\sigma\pi)$ Γ_2/Γ_3

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.24 ± 0.07 BAKER 99 SPEC $1.94 \bar{p}p \rightarrow 4\pi^0$

$\Gamma(\rho\pi D\text{-wave})/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

seen	CHUNG 02	B852	$18.3 \pi^- p \rightarrow \pi^+ \pi^- \pi^- p$
seen	AMELIN 95B	VES	$36 \pi^- A \rightarrow \pi^+ \pi^- \pi^- A$

$\Gamma(\omega\pi\pi)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

seen 35280 ³ BAKER 03 SPEC $\bar{p}p \rightarrow \omega\pi^+\pi^-\pi^0$

$\Gamma(f_1(1285)\pi)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen	KUHN 04	B852	$18 \pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$
seen	LEE 94	MPS2	$18 \pi^- p \rightarrow K^+ \bar{K}^0 \pi^- \pi^- p$

$\Gamma(a_1(1260)\eta)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
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not seen KUHN 04 B852 $18 \pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$

³ Assuming the $\omega\rho$ mechanism for the $\omega\pi\pi$ state.

$a_1(1640)$ REFERENCES

KUHN	04	PL B595 109	J. Kuhn <i>et al.</i>	(BNL E852 Collab.)
BAKER	03	PL B563 140	C.A. Baker <i>et al.</i>	
CHUNG	02	PR D65 072001	S.U. Chung <i>et al.</i>	(BNL E852 Collab.)
ASNER	00	PR D61 012002	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BAKER	99	PL B449 114	C.A. Baker <i>et al.</i>	
ABREU	98G	PL B426 411	P. Abreu <i>et al.</i>	(DELPHI Collab.)
AMELIN	95B	PL B356 595	D.V. Amelin <i>et al.</i>	(SERP, TBIL)
LEE	94	PL B323 227	J.H. Lee <i>et al.</i>	(BNL, IND, KYUN, MASD+)
BOWLER	88	PL B209 99	M.G. Bowler	(OXF)
BELLINI	85	SJNP 41 781	D. Bellini <i>et al.</i>	

Translated from YAF 41 1223.

NODE=M161W;LINKAGE=KB

NODE=M161215;NODE=M161

DESIG=3;OUR EST; \rightarrow UNCHECKED
 DESIG=1;OUR EST; \rightarrow UNCHECKED
 DESIG=2;OUR EST; \rightarrow UNCHECKED
 DESIG=7;OUR EST; \rightarrow UNCHECKED
 DESIG=4;OUR EST; \rightarrow UNCHECKED
 DESIG=5;OUR EST; \rightarrow UNCHECKED
 DESIG=6;OUR EST; \rightarrow UNCHECKED
 DESIG=8

NODE=M161220

NODE=M161R1
 NODE=M161R1

NODE=M161R2
 NODE=M161R2

NODE=M161R3
 NODE=M161R3

NODE=M161R4
 NODE=M161R4

NODE=M161R5
 NODE=M161R5

NODE=M161R;LINKAGE=KB

NODE=M161

REFID=49773
 REFID=49414
 REFID=48837
 REFID=47339
 REFID=46888
 REFID=45909
 REFID=44433
 REFID=44092
 REFID=40578
 REFID=47490

NODE=M117

 $f_2(1640)$ $I^G(J^{PC}) = 0^+(2^{++})$

OMITTED FROM SUMMARY TABLE

 $f_2(1640)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1639 ± 6 OUR AVERAGE	Error includes scale factor of 1.2.		
1620 ± 16	BUGG 95	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$
1647 ± 7	ADAMO 92	OBLX	$\bar{n}p \rightarrow 3\pi^+2\pi^-$
1635 ± 7	ALDE 90	GAM2	38 $\pi^- p \rightarrow \omega\omega n$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1640 ± 5	AMSLER 06	CBAR	0.9 $\bar{p}p \rightarrow K^+K^-\pi^0$
1659 ± 6	VLADIMIRSK..06	SPEC	40 $\pi^- p \rightarrow K_S^0 K_S^0 n$
1643 ± 7	¹ ALDE 89B	GAM2	38 $\pi^- p \rightarrow \omega\omega n$

¹ Superseded by ALDE 90.

NODE=M117M

NODE=M117M

 $f_2(1640)$ WIDTH

VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT
99⁺⁶⁰₋₄₀ OUR AVERAGE		Error includes scale factor of 2.9.		
140 ⁺⁶⁰ ₋₂₀		BUGG 95	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$
58 ± 20		ADAMO 92	OBLX	$\bar{n}p \rightarrow 3\pi^+2\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
44 ± 9		AMSLER 06	CBAR	0.9 $\bar{p}p \rightarrow K^+K^-\pi^0$
152 ± 18		VLADIMIRSK..06	SPEC	40 $\pi^- p \rightarrow K_S^0 K_S^0 n$
< 70	90	ALDE 90	GAM2	38 $\pi^- p \rightarrow \omega\omega n$

NODE=M117M;LINKAGE=BB

NODE=M117W

NODE=M117W

 $f_2(1640)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \omega\omega$	seen
$\Gamma_2 4\pi$	seen
$\Gamma_3 K\bar{K}$	seen

NODE=M117215;NODE=M117

DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=3 **$f_2(1640)$ BRANCHING RATIOS**

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
seen	AMSLER 06	CBAR	0.9 $\bar{p}p \rightarrow K^+K^-\pi^0$	

NODE=M117220

NODE=M117R2
NODE=M117R2 **$f_2(1640)$ REFERENCES**

AMSLER 06	PL B639 165	C. Amsler <i>et al.</i>	(CBAR Collab.)
VLADIMIRSK...06	PAN 69 493	V.V. Vladimirska <i>et al.</i>	(ITEP, Moscow)
	Translated from YAF 69 515.		
BUGG 95	PL B353 378	D.V. Bugg <i>et al.</i>	(LOQM, PNPI, WASH) JP
ADAMO 92	PL B287 368	A. Adamo <i>et al.</i>	(OBELIX Collab.)
ALDE 90	PL B241 600	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)
ALDE 89B	PL B216 451	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+) IGJPC

NODE=M117

REFID=51136
REFID=51191
REFID=44438
REFID=42177
REFID=40935
REFID=40735

$\eta_2(1645)$ $I^G(J^{PC}) = 0^+(2^-+)$

NODE=M154

 $\eta_2(1645)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
1617± 5 OUR AVERAGE				
1613± 8	BARBERIS 00B		450	$p p \rightarrow p_f \eta \pi^+ \pi^- p_s$
1617± 8	BARBERIS 00C		450	$p p \rightarrow p_f 4\pi p_s$
1620±20	BARBERIS 97B OMEG		450	$p p \rightarrow p p 2(\pi^+ \pi^-)$
1645±14±15	ADOMEIT 96 CBAR 0	1.94	$\bar{p} p \rightarrow \eta 3\pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1645± 6±20	ANISOVICH 00E SPEC		0.9–1.94	$\bar{p} p \rightarrow \eta 3\pi^0$

NODE=M154M

NODE=M154M

 $\eta_2(1645)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
181±11 OUR AVERAGE				
185±17	BARBERIS 00B		450	$p p \rightarrow p_f \eta \pi^+ \pi^- p_s$
177±18	BARBERIS 00C		450	$p p \rightarrow p_f 4\pi p_s$
180±25	BARBERIS 97B OMEG		450	$p p \rightarrow p p 2(\pi^+ \pi^-)$
180 ⁺⁴⁰ ₋₂₁ ±25	ADOMEIT 96 CBAR 0	1.94	$\bar{p} p \rightarrow \eta 3\pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
200±25	ANISOVICH 00E SPEC		0.9–1.94	$\bar{p} p \rightarrow \eta 3\pi^0$

NODE=M154W

NODE=M154W

 $\eta_2(1645)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 a_2(1320)\pi$	seen
$\Gamma_2 K\bar{K}\pi$	seen
$\Gamma_3 K^*\bar{K}$	seen
$\Gamma_4 \eta\pi^+\pi^-$	seen
$\Gamma_5 a_0(980)\pi$	seen
$\Gamma_6 f_2(1270)\eta$	not seen

NODE=M154215; NODE=M154

DESIG=1;OUR EST; \rightarrow UNCHECKED
 DESIG=2;OUR EST; \rightarrow UNCHECKED
 DESIG=3;OUR EST; \rightarrow UNCHECKED
 DESIG=4;OUR EST; \rightarrow UNCHECKED
 DESIG=5;OUR EST; \rightarrow UNCHECKED
 DESIG=6;OUR EST; \rightarrow UNCHECKED

 $\eta_2(1645)$ BRANCHING RATIOS

$\Gamma(K\bar{K}\pi)/\Gamma(a_2(1320)\pi)$	Γ_2/Γ_1
0.07±0.03	1 BARBERIS 97C OMEG 450 $p p \rightarrow p p K\bar{K}\pi$

¹ Using $2(\pi^+\pi^-)$ data from BARBERIS 97B.

NODE=M154220

NODE=M154R1
NODE=M154R1

$\Gamma(a_2(1320)\pi)/\Gamma(a_0(980)\pi)$	Γ_1/Γ_5
13.1±2.3 OUR AVERAGE	1 ANISOVICH 11 SPEC 0.9–1.94 $p\bar{p}$ 2 BARBERIS 00B 450 $p p \rightarrow p_f \eta \pi^+ \pi^- p_s$

NODE=M154R1;LINKAGE=A

NODE=M154R3
NODE=M154R3

$\Gamma(f_2(1270)\eta)/\Gamma_{\text{total}}$	Γ_6/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •	
not seen	BARBERIS 00B 450 $p p \rightarrow p_f \eta \pi^+ \pi^- p_s$

NODE=M154R3;LINKAGE=AN

NODE=M154R4
NODE=M154R4 **$\eta_2(1645)$ REFERENCES**

ANISOVICH 11 EPJ C71 1511	A.V. Anisovich <i>et al.</i>	(LOQM, RAL, PNPI)
ANISOVICH 00E PL B477 19	A.V. Anisovich <i>et al.</i>	
BARBERIS 00B PL B471 435	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS 00C PL B471 440	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS 97B PL B413 217	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS 97C PL B413 225	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ADOMEIT 96 ZPHY C71 227	J. Adomeit <i>et al.</i>	(Crystal Barrel Collab.)

NODE=M154

REFID=53631
 REFID=47945
 REFID=47958
 REFID=47959
 REFID=45758
 REFID=45759
 REFID=45202

$\omega(1650)$ $I^G(J^{PC}) = 0^-(1^- -)$

NODE=M126

 $\omega(1650)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1670 ± 30 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1667 ± 13 ± 6		AUBERT 07AU BABR	10.6 $e^+ e^- \rightarrow \omega \pi^+ \pi^- \gamma$	
1645 ± 8	13	AUBERT 06D BABR	10.6 $e^+ e^- \rightarrow \omega \eta \gamma$	
1660 ± 10 ± 2		AUBERT,B 04N BABR	10.6 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$	
1770 ± 50 ± 60	1.2M	¹ ACHASOV 03D RVUE	0.44–2.00 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
1619 ± 5		² HENNER 02 RVUE	1.2–2.0 $e^+ e^- \rightarrow \rho \pi, \omega \pi \pi$	
1700 ± 20		EUGENIO 01 SPEC	18 $\pi^- p \rightarrow \omega \eta n$	OCCUR=2
1705 ± 26	612	³ AKHMETSHIN 00D CMD2	$e^+ e^- \rightarrow \omega \pi^+ \pi^-$	
1820^{+190}_{-150}		⁴ ACHASOV 98H RVUE	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
1840^{+100}_{-70}		⁵ ACHASOV 98H RVUE	$e^+ e^- \rightarrow \omega \pi^+ \pi^-$	OCCUR=2
1780^{+170}_{-300}		⁶ ACHASOV 98H RVUE	$e^+ e^- \rightarrow K^+ K^-$	OCCUR=3
~ 2100		⁷ ACHASOV 98H RVUE	$e^+ e^- \rightarrow K_S^0 K^\pm \pi^\mp$	OCCUR=4
1606 ± 9		⁸ CLEGG 94 RVUE		OCCUR=5
1662 ± 13	750	⁹ ANTONELLI 92 DM2	1.34–2.4 $e^+ e^- \rightarrow \rho \pi, \omega \pi \pi$	OCCUR=4
1670 ± 20		ATKINSON 83B OMEG	20–70 $\gamma p \rightarrow 3\pi X$	NODE=M126M;LINKAGE=VH
1657 ± 13		CORDIER 81 DM1	$e^+ e^- \rightarrow \omega 2\pi$	NODE=M126M;LINKAGE=AB
1679 ± 34	21	ESPOSITO 80 FRAM	$e^+ e^- \rightarrow 3\pi$	NODE=M126M;LINKAGE=KI
1652 ± 17		COSME 79 OSPK	$e^+ e^- \rightarrow 3\pi$	NODE=M126M;LINKAGE=L1

¹ From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega \pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

² Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.

³ Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho \pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.

⁴ Using data from BARKOV 87, DOLINSKY 91, and ANTONELLI 92.

⁵ Using the data from ANTONELLI 92.

⁶ Using the data from IVANOV 81 and BISELLO 88B.

⁷ Using the data from BISELLO 91C.

⁸ From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.

⁹ From the combined fit of the $\rho \pi$ and $\omega \pi \pi$ final states.

NODE=M126M

NODE=M126M

→ UNCHECKED ←

 $\omega(1650)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
315 ± 35 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
222 ± 25 ± 20		AUBERT 07AU BABR	10.6 $e^+ e^- \rightarrow \omega \pi^+ \pi^- \gamma$	
114 ± 14	13	AUBERT 06D BABR	10.6 $e^+ e^- \rightarrow \omega \eta \gamma$	
230 ± 30 ± 20		AUBERT,B 04N BABR	10.6 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$	
$490^{+200}_{-150} \pm 130$	1.2M	¹⁰ ACHASOV 03D RVUE	0.44–2.00 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$	
250 ± 14		¹¹ HENNER 02 RVUE	1.2–2.0 $e^+ e^- \rightarrow \rho \pi, \omega \pi \pi$	
250 ± 50		EUGENIO 01 SPEC	18 $\pi^- p \rightarrow \omega \eta n$	OCCUR=2
370 ± 25	612	¹² AKHMETSHIN 00D CMD2	$e^+ e^- \rightarrow \omega \pi^+ \pi^-$	OCCUR=5
113 ± 20		¹³ CLEGG 94 RVUE		OCCUR=4
280 ± 24	750	¹⁴ ANTONELLI 92 DM2	1.34–2.4 $e^+ e^- \rightarrow \rho \pi, \omega \pi \pi$	
160 ± 20		ATKINSON 83B OMEG	20–70 $\gamma p \rightarrow 3\pi X$	
136 ± 46		CORDIER 81 DM1	$e^+ e^- \rightarrow \omega 2\pi$	
99 ± 49	21	ESPOSITO 80 FRAM	$e^+ e^- \rightarrow 3\pi$	
42 ± 17		COSME 79 OSPK	$e^+ e^- \rightarrow 3\pi$	

NODE=M126W

NODE=M126W

→ UNCHECKED ←

NODE=M126M

NODE=M126M

→ UNCHECKED ←

- 10 From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega \pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.
- 11 Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.
- 12 Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.
- 13 From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.
- 14 From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.

$\omega(1650)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \rho\pi$	seen
$\Gamma_2 \omega\pi\pi$	seen
$\Gamma_3 \omega\eta$	seen
$\Gamma_4 e^+ e^-$	seen

$\omega(1650) \Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

$\Gamma(\rho\pi)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_1/\Gamma \times \Gamma_4/\Gamma$
<u>VALUE (units 10^{-6})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
1.3 ± 0.1 ± 0.1	AUBERT,B 04N BABR $10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$
1.2 ± 0.4 ± 0.8 1.2M 15,16	ACHASOV 03D RVUE $0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.921 ± 0.230	17,18 CLEGG 94 RVUE
0.479 ± 0.050	750 19,20 ANTONELLI 92 DM2 $1.34-2.4 e^+ e^- \rightarrow \rho\pi, \omega\pi\pi$

$\Gamma(\omega\pi\pi)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_2/\Gamma \times \Gamma_4/\Gamma$
<u>VALUE (units 10^{-7})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
7.0 ± 0.5	AUBERT 07AU BABR $10.6 e^+ e^- \rightarrow \omega\pi^+ \pi^- \gamma$
4.1 ± 0.9 ± 1.3 1.2M 15,16	ACHASOV 03D RVUE $0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
5.40 ± 0.95	21 AKHMETSHIN 00D CMD2 $1.2-1.38 e^+ e^- \rightarrow \omega\pi^+ \pi^-$
3.18 ± 0.80	17,18 CLEGG 94 RVUE
6.07 ± 0.61	750 19,20 ANTONELLI 92 DM2 $1.34-2.4 e^+ e^- \rightarrow \rho\pi, \omega\pi\pi$

$\Gamma(\omega\eta)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_3/\Gamma \times \Gamma_4/\Gamma$
<u>VALUE (units 10^{-6})</u>	<u>CL%</u> <u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
0.57 ± 0.06	13 AUBERT 06D BABR $10.6 e^+ e^- \rightarrow \omega\eta\gamma$
< 6	90 22 AKHMETSHIN 03B CMD2 $e^+ e^- \rightarrow \eta\pi^0 \gamma$
15 Calculated by us from the cross section at the peak.	
16 From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega\pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.	
17 From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.	
18 From the partial and leptonic width given by the authors.	
19 From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.	
20 From the product of the leptonic width and partial branching ratio given by the authors.	
21 Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.	
22 $\omega(1650)$ mass and width fixed at 1700 MeV and 250 MeV, respectively.	

$\omega(1650)$ BRANCHING RATIOS

$\Gamma(\omega\pi\pi)/\Gamma_{\text{total}}$	Γ_2/Γ
<u>VALUE</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
~ 0.35	1.2M 23 ACHASOV 03D RVUE $0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.620 ± 0.014	24 HENNER 02 RVUE $1.2-2.0 e^+ e^- \rightarrow \rho\pi, \omega\pi\pi$

NODE=M126W;LINKAGE=VH

NODE=M126W;LINKAGE=AB

NODE=M126W;LINKAGE=KI

NODE=M126W;LINKAGE=AD

NODE=M126W;LINKAGE=AE

NODE=M126215;NODE=M126

DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=4;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow

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NODE=M126G3NODE=M126G4
NODE=M126G4NODE=M126G5
NODE=M126G5NODE=M126G;LINKAGE=AW
NODE=M126G;LINKAGE=VH

NODE=M126G;LINKAGE=AD

NODE=M126G;LINKAGE=SE
NODE=M126G;LINKAGE=AE
NODE=M126G;LINKAGE=ES
NODE=M126G;LINKAGE=KL

NODE=M126G5;LINKAGE=KH

NODE=M126225

NODE=M126R2
NODE=M126R2

$\Gamma(\rho\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.65	1.2M	23 ACHASOV	03D RVUE	$0.44 - 2.00 \frac{e^+ e^-}{\pi^+ \pi^- \pi^0}$	
0.380 ± 0.014		24 HENNER	02 RVUE	$1.2 - 2.0 \frac{e^+ e^-}{\rho\pi, \omega\pi\pi}$	

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$					Γ_4/Γ
<u>VALUE (units 10^{-7})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 18	1.2M	24,25 ACHASOV	03D RVUE	$0.44 - 2.00 \frac{e^+ e^-}{\pi^+ \pi^- \pi^0}$	
32 ± 1		24 HENNER	02 RVUE	$1.2 - 2.0 \frac{e^+ e^-}{\rho\pi, \omega\pi\pi}$	

23 From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega\pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

24 Assuming that the $\omega(1650)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.

25 Calculated by us from the cross section at the peak.

NODE=M126R3
NODE=M126R3

NODE=M126R4
NODE=M126R4

NODE=M126R;LINKAGE=VH

NODE=M126R;LINKAGE=AC
NODE=M126R;LINKAGE=AW

NODE=M126

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REFID=47935
REFID=47391
REFID=46323
REFID=44081
REFID=43168
REFID=41867
REFID=41369
REFID=40581
REFID=40280

$\omega(1650)$ REFERENCES					
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)	
AUBERT	06D	PR D73 052003	B. Aubert <i>et al.</i>	(BABAR Collab.)	
AUBERT,B	04N	PR D70 072004	B. Aubert <i>et al.</i>	(BABAR Collab.)	
ACHASOV	03D	PR D68 052006	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	
AKHMETSHIN	03B	PL B562 173	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	
ACHASOV	02E	PR D66 032001	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	
HENNER	02	EPJ C26 3	V.K. Henner <i>et al.</i>		
ACHASOV	01E	PR D63 072002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	
EUGENIO	01	PL B497 190	P. Eugenio <i>et al.</i>		
AKHMETSHIN	00D	PL B489 125	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)	
ACHASOV	99E	PL B462 365	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)	
ACHASOV	98H	PR D57 4334	N.N. Achasov, A.A. Kozhevnikov		
CLEGG	94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)	
ANTONELLI	92	ZPHY C56 15	A. Antonelli <i>et al.</i>	(DM2 Collab.)	
BISELLO	91C	ZPHY C52 227	D. Bisello <i>et al.</i>	(DM2 Collab.)	
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)	
BISELLO	88B	ZPHY C39 13	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)	
BARKOV	87	JETPL 46 164	L.M. Barkov <i>et al.</i>	(NOVO)	
		Translated from ZETFP 46 132.			
ATKINSON	83B	PL 127B 132	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	
CORDIER	81	PL 106B 155	A. Cordier <i>et al.</i>	(ORsay)	
IVANOV	81	PL 107B 297	P.M. Ivanov <i>et al.</i>	(NOVO)	
ESPOSITO	80	LNC 28 195	B. Esposito <i>et al.</i>	(FRAS, NAPL, PADO+)	
COSME	79	NP B152 215	G. Cosme <i>et al.</i>	(IPN)	

REFID=21502
REFID=21586
REFID=20553
REFID=21584
REFID=21475

$\omega_3(1670)$

$I^G(J^{PC}) = 0^-(3^- -)$

$\omega_3(1670)$ MASS						
<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1667 ± 4 OUR AVERAGE						
1665.3 ± 5.2 ± 4.5	23400	AMELIN	96	VES	36 $\pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$	NODE=M045M
1685 ± 20	60	BAUBILLIER	79	HBC	8.2 $K^- p$ backward	NODE=M045M
1673 ± 12	430	BALTAY	78E	HBC	15 $\pi^+ p \rightarrow \Delta 3\pi$	
1650 ± 12		CORDEN	78B	OMEG	8–12 $\pi^- p \rightarrow N 3\pi$	
1669 ± 11	600	WAGNER	75	HBC	7 $\pi^+ p \rightarrow \Delta^{++} 3\pi$	OCCUR=2
1678 ± 14	500	DIAZ	74	DBC	6 $\pi^+ n \rightarrow p 3\pi^0$	
1660 ± 13	200	DIAZ	74	DBC	6 $\pi^+ n \rightarrow p \omega \pi^0 \pi^0$	
1679 ± 17	200	MATTHEWS	71D	DBC	7.0 $\pi^+ n \rightarrow p 3\pi^0$	
1670 ± 20		KENYON	69	DBC	8 $\pi^+ n \rightarrow p 3\pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
~1700	110	CERRADA	77B	HBC	4.2 $K^- p \rightarrow \Lambda 3\pi$	NODE=M045M;LINKAGE=E
1695 ± 20		BARNES	69B	HBC	4.6 $K^- p \rightarrow \omega 2\pi X$	NODE=M045M;LINKAGE=P
1636 ± 20		ARMENISE	68B	DBC	5.1 $\pi^+ n \rightarrow p 3\pi^0$	
1 Phase rotation seen for $J^P = 3^- \rho \pi$ wave.						
2 From a fit to $I(J^P) = 0(3^-) \rho \pi$ partial wave.						

$\omega_3(1670)$ WIDTH						
<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
168 ± 10 OUR AVERAGE						
149 ± 19 ± 7	23400	AMELIN	96	VES	36 $\pi^- p \rightarrow \pi^+ \pi^- \pi^0 n$	NODE=M045W
160 ± 80	60	BAUBILLIER	79	HBC	8.2 $K^- p$ backward	NODE=M045W
173 ± 16	430	BALTAY	78E	HBC	15 $\pi^+ p \rightarrow \Delta 3\pi$	
253 ± 39		CORDEN	78B	OMEG	8–12 $\pi^- p \rightarrow N 3\pi$	
173 ± 28	600	WAGNER	75	HBC	7 $\pi^+ p \rightarrow \Delta^{++} 3\pi$	OCCUR=2
167 ± 40	500	DIAZ	74	DBC	6 $\pi^+ n \rightarrow p 3\pi^0$	
122 ± 39	200	DIAZ	74	DBC	6 $\pi^+ n \rightarrow p \omega \pi^0 \pi^0$	
155 ± 40	200	MATTHEWS	71D	DBC	7.0 $\pi^+ n \rightarrow p 3\pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
90 ± 20		BARNES	69B	HBC	4.6 $K^- p \rightarrow \omega 2\pi$	NODE=M045W;LINKAGE=S
100 ± 40		KENYON	69	DBC	8 $\pi^+ n \rightarrow p 3\pi^0$	NODE=M045W;LINKAGE=E
112 ± 60		ARMENISE	68B	DBC	5.1 $\pi^+ n \rightarrow p 3\pi^0$	NODE=M045W;LINKAGE=P
3 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.						
4 Phase rotation seen for $J^P = 3^- \rho \pi$ wave.						
5 From a fit to $I(J^P) = 0(3^-) \rho \pi$ partial wave.						

$\omega_3(1670)$ DECAY MODES						
<u>Mode</u>	<u>Fraction (Γ_i/Γ)</u>					
$\Gamma_1 \rho \pi$	seen					
$\Gamma_2 \omega \pi \pi$	seen					
$\Gamma_3 b_1(1235) \pi$	possibly seen					

$\omega_3(1670)$ BRANCHING RATIOS						
<u>$\Gamma(\omega \pi \pi)/\Gamma(\rho \pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>Γ_2/Γ_1</u>		
VALUE						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.71 ± 0.27	100	DIAZ	74	DBC	6 $\pi^+ n \rightarrow p 5\pi^0$	NODE=M045215;NODE=M045
<u>$\Gamma(b_1(1235)\pi)/\Gamma(\rho \pi)$</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>Γ_3/Γ_1</u>		
VALUE						
possibly seen		DIAZ	74	DBC	6 $\pi^+ n \rightarrow p 5\pi^0$	NODE=M045R3

$\Gamma(b_1(1235)\pi)/\Gamma(\omega\pi\pi)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>0.75	68	BAUBILLIER	79	HBC	8.2 $K^- p$ backward

 $\omega_3(1670)$ REFERENCES

AMELIN	96	ZPHY C70 71	D.V. Amelin <i>et al.</i>	(SERP, TBIL)
BAUBILLIER	79	PL 89B 131	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
BALTY	78E	PRL 40 87	C. Baltay, C.V. Cautis, M. Kalelkar	(COLU) JP
CORDEN	78B	NP B138 235	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+)
CERRADA	77B	NP B126 241	M. Cerrada <i>et al.</i>	(AMST, CERN, NIJM+) JP
WAGNER	75	PL 58B 201	F. Wagner, M. Tabak, D.M. Chew	(LBL) JP
DIAZ	74	PRL 32 260	J. Diaz <i>et al.</i>	(CASE, CMU)
MATTHEWS	71D	PR D3 2561	J.A.J. Matthews <i>et al.</i>	(TNTO, WISC)
BARNES	69B	PRL 23 142	V.E. Barnes <i>et al.</i>	(BNL)
KENYON	69	PRL 23 146	I.R. Kenyon <i>et al.</i>	(UCND, ORNL)
ARMENISE	68B	PL 26B 336	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ+)

 $\pi_2(1670)$

$I^G(J^{PC}) = 1^-(2^{-+})$

 $\pi_2(1670)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1672.2 ± 3.0 OUR AVERAGE					Error includes scale factor of 1.4. See the ideogram below.
1658	± 3	+ 24 - 8	420k	ALEKSEEV	10 COMP
1749	± 10	± 100	145k	LU	05 B852
1676	± 3	± 8		¹ CHUNG	02 B852
1685	± 10	± 30		² BARBERIS	01
1687	± 9	± 15		AMELIN	99 VES
1669	± 4			BARBERIS	98B
1670	± 4			BARBERIS	98B
1730	± 20			³ AMELIN	95B VES
1690	± 14			⁴ BERDNIKOV	94 VES
1710	± 20		700	ANTIPOV	87 SIGM -
1676	± 6			⁴ EVANGELIS...	81 OMEG -
1657	± 14			^{4,5} DAUM	80D SPEC -
1662	± 10	2000		⁴ BALTY	77 HBC +
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1742	± 31	± 49		ANTREASYAN	90 CBAL
1624	± 21			¹ BELLINI	85 SPEC
1622	± 35			⁶ BELLINI	85 SPEC
1693	± 28			⁷ BELLINI	85 SPEC
1710	± 20			⁸ DAUM	81B SPEC -
1660	± 10			⁴ ASCOLI	73 HBC -

1 From $f_2(1270)\pi$ decay.

2 From a fit to the invariant mass distribution.

3 From a fit to $J^{PC} = 2^{-+}$ $f_2(1270)\pi$, $f_0(1370)\pi$ waves.

4 From a fit to $J^P = 2^-$ S-wave $f_2(1270)\pi$ partial wave.

5 Clear phase rotation seen in $2^- S$, $2^- P$, $2^- D$ waves. We quote central value and spread of single-resonance fits to three channels.

6 From $\rho\pi$ decay.

7 From $\sigma\pi$ decay.

8 From a two-resonance fit to four $2^- 0^+$ waves. This should not be averaged with all the single resonance fits.

NODE=M045R5
NODE=M045R5

NODE=M045

REFID=44649
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REFID=20537
REFID=20843
REFID=21248
REFID=21515
REFID=21512
REFID=20800
REFID=20783

NODE=M034

NODE=M034M

NODE=M034M

OCCUR=2

NODE=M034M;LINKAGE=F2
NODE=M034M;LINKAGE=BR

NODE=M034M;LINKAGE=AX

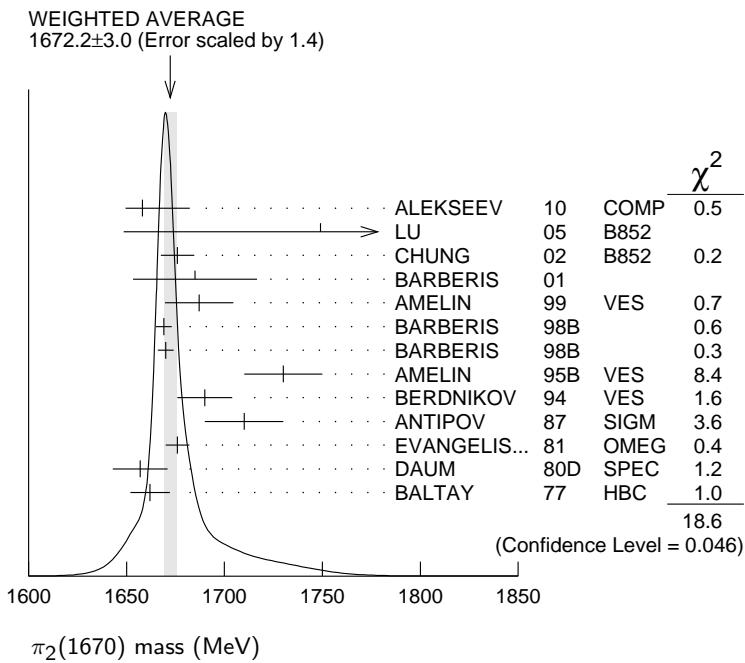
NODE=M034M;LINKAGE=P

NODE=M034M;LINKAGE=D

NODE=M034M;LINKAGE=R2

NODE=M034M;LINKAGE=S2

NODE=M034M;LINKAGE=L



$\pi_2(1670)$ mass (MeV)

$\pi_2(1670)$ WIDTH

NODE=M034W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
260\pm 9 OUR AVERAGE		Error includes scale factor of 1.2.			NODE=M034W
271 \pm 9 \pm 22	420k	ALEKSEEV	10	COMP	190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
408 \pm 60 \pm 250	145k	LU	05	B852	18 $\pi^- p \rightarrow \omega \pi^- \pi^0 p$
254 \pm 3 \pm 31	9 CHUNG		02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$
265 \pm 30 \pm 40	10 BARBERIS		01		450 $p p \rightarrow p_f 3\pi^0 p_s$
168 \pm 43 \pm 53	AMELIN		99	VES	37 $\pi^- A \rightarrow \omega \pi^- \pi^0 A^*$
268 \pm 15	BARBERIS		98B		450 $p p \rightarrow p_f \rho \pi p_s$
256 \pm 15	BARBERIS		98B		450 $p p \rightarrow p_f f_2(1270) \pi p_s$
310 \pm 20	11 AMELIN		95B	VES	36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$
190 \pm 50	12 BERDNIKOV		94	VES	37 $\pi^- A \rightarrow K^+ K^- \pi^- A$
170 \pm 80	700	ANTIPOV	87	SIGM	50 $\pi^- Cu \rightarrow \mu^+ \mu^- \pi^- Cu$
260 \pm 20	12 EVANGELIS...		81	OMEG	12 $\pi^- p \rightarrow 3\pi p$
219 \pm 20	12,13 DAUM		80D	SPEC	63-94 $\pi p \rightarrow 3\pi X$
285 \pm 60	2000	12 BALTAY	77	HBC	15 $\pi^+ p \rightarrow p 3\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
236 \pm 49 \pm 36	ANTREASYAN	90	CBAL		$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0$
304 \pm 22	9 BELLINI		85	SPEC	40 $\pi^- A \rightarrow \pi^- \pi^+ \pi^- A$
404 \pm 108	14 BELLINI		85	SPEC	40 $\pi^- A \rightarrow \pi^- \pi^+ \pi^- A$
330 \pm 90	15 BELLINI		85	SPEC	40 $\pi^- A \rightarrow \pi^- \pi^+ \pi^- A$
312 \pm 50	16 DAUM		81B	SPEC	63,94 $\pi^- p$
270 \pm 60	12 ASCOLI		73	HBC	5-25 $\pi^- p \rightarrow p \pi_2$

9 From $f_2(1270)\pi$ decay.

10 From a fit to the invariant mass distribution.

11 From a fit to $J^{PC} = 2^- + f_2(1270)\pi$, $f_0(1370)\pi$ waves.

12 From a fit to $J^P = 2^- f_2(1270)\pi$ partial wave.

13 Clear phase rotation seen in $2^- S$, $2^- P$, $2^- D$ waves. We quote central value and spread of single-resonance fits to three channels.

14 From $\rho\pi$ decay.

15 From $\sigma\pi$ decay.

16 From a two-resonance fit to four $2^- 0^+$ waves. This should not be averaged with all the single resonance fits.

NODE=M034W;LINKAGE=F2

NODE=M034W;LINKAGE=BR

NODE=M034W;LINKAGE=AX

NODE=M034W;LINKAGE=P

NODE=M034W;LINKAGE=D

NODE=M034W;LINKAGE=R2

NODE=M034W;LINKAGE=S2

NODE=M034W;LINKAGE=L

$\pi_2(1670)$ DECAY MODES

NODE=M034215;NODE=M034

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 3π	(95.8±1.4) %	
Γ_2 $\pi^+\pi^-\pi^0$		DESIG=20
Γ_3 $\pi^0\pi^0\pi^0$		DESIG=22
Γ_4 $f_2(1270)\pi$	(56.3±3.2) %	DESIG=23
Γ_5 $\rho\pi$	(31 ± 4) %	DESIG=8
Γ_6 $\sigma\pi$	(10.9±3.4) %	DESIG=2
Γ_7 $(\pi\pi)_S$ -wave	(8.7±3.4) %	DESIG=13
Γ_8 $K\bar{K}^*(892)+$ c.c.	(4.2±1.4) %	DESIG=11
Γ_9 $\omega\rho$	(2.7±1.1) %	DESIG=5
Γ_{10} $\gamma\gamma$	< 2.8 × 10 ⁻⁷	90%
Γ_{11} $\eta\pi$		DESIG=14
Γ_{12} $\pi^\pm 2\pi^+ 2\pi^-$		DESIG=12
Γ_{13} $\rho(1450)\pi$	< 3.6 × 10 ⁻³	DESIG=3
Γ_{14} $b_1(1235)\pi$	< 1.9 × 10 ⁻³	DESIG=4
Γ_{15} $\eta 3\pi$		DESIG=15
Γ_{16} $f_1(1285)\pi$	possibly seen	DESIG=16
Γ_{17} $a_2(1320)\pi$	not seen	DESIG=24

CONSTRAINED FIT INFORMATION

An overall fit to 4 branching ratios uses 6 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 = 1.9$ for 3 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|ccc}
x_5 & -53 & & \\
x_7 & -29 & -59 & \\
x_8 & -8 & -21 & -9 \\
\hline x_4 & x_5 & x_7
\end{array}$$

 $\pi_2(1670)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$					Γ_{10}
VALUE (keV)	CL%	DOCUMENT ID	TECN	CHG	COMMENT
<0.072	90	17 ACCIARRI	97T L3		$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.19	90	17 ALBRECHT	97B ARG		$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$
1.41 ± 0.23 ± 0.28		ANTREASYAN	90 CBAL	0	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0$
0.8 ± 0.3 ± 0.12		18 BEHREND	90C CELL	0	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$
1.3 ± 0.3 ± 0.2		19 BEHREND	90C CELL	0	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$

17 Decaying into $f_2(1270)\pi$ and $\rho\pi$.18 Constructive interference between $f_2(1270)\pi, \rho\pi$ and background.

19 Incoherent Ansatz.

NODE=M034217

NODE=M034W1
NODE=M034W1

OCCUR=2

NODE=M034W1;LINKAGE=QQ
NODE=M034W1;LINKAGE=CC
NODE=M034W1;LINKAGE=GG

NODE=M034230

NODE=M034G01
NODE=M034G01

NODE=M034G01;LINKAGE=SC

 $\pi_2(1670) \Gamma(i) \Gamma(\gamma\gamma) / \Gamma(\text{total})$

$\Gamma(\pi^+\pi^-\pi^0) \times \Gamma(\gamma\gamma) / \Gamma_{\text{total}}$				$\Gamma_2 \Gamma_{10} / \Gamma$
VALUE (keV)	CL%	DOCUMENT ID	TECN	COMMENT
<0.1	95	20 SCHEGELSKY	06 RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$

20 From analysis of L3 data at 183–209 GeV.

$\pi_2(1670)$ BRANCHING RATIOS **$\Gamma(3\pi)/\Gamma_{\text{total}}$** VALUE **$0.958 \pm 0.014$ OUR FIT**DOCUMENT ID **$\Gamma_1/\Gamma = (\Gamma_4 + \Gamma_5 + \Gamma_7)/\Gamma$**

NODE=M034220

 $\Gamma(\pi^0\pi^0\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ VALUE **$0.29 \pm 0.03 \pm 0.05$** DOCUMENT IDCOMMENT **Γ_3/Γ_2**

NODE=M034R20

NODE=M034R20

 $\Gamma(\rho\pi)/0.565\Gamma(f_2(1270)\pi)$ (With $f_2(1270) \rightarrow \pi^+\pi^-$.)VALUE **0.97 ± 0.09 OUR AVERAGE**DOCUMENT IDTECN **$\Gamma_5/0.565\Gamma_4$**

NODE=M034R21

NODE=M034R21

 $0.76 \pm 0.07 \pm 0.10$ 1.01 ± 0.05 DOCUMENT IDTECNCOMMENT

Error includes scale factor of 1.9.

CHUNG 02 B852

 $18.3 \pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

BARBERIS 98B

 $450 pp \rightarrow p_f \pi^+ \pi^- \pi^0 p_s$ **$\Gamma(\sigma\pi)/\Gamma(f_2(1270)\pi)$** VALUE **$0.19 \pm 0.06$ OUR AVERAGE**DOCUMENT IDTECN **Γ_6/Γ_4**

NODE=M034R15

NODE=M034R15

 $0.17 \pm 0.02 \pm 0.07$ 0.24 ± 0.10

22,23

CHUNG 02 B852

 $18.3 \pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

BAKER 99 SPEC

 $1.94 \bar{p}p \rightarrow 4\pi^0$ **$\frac{1}{2}\Gamma(\rho\pi)/\Gamma(\pi^\pm\pi^+\pi^-)$** **$\frac{1}{2}\Gamma_5/(0.565\Gamma_4 + \frac{1}{2}\Gamma_5 + 0.624\Gamma_7)$** VALUE **$0.29 \pm 0.04$ OUR FIT** **0.29 ± 0.05** DOCUMENT IDTECNCHGCOMMENT

24 DAUM

SPEC

 $63,94 \pi^- p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

 <0.3

BARTSCH 68 HBC

+

 $8 \pi^+ p \rightarrow 3\pi p$ **$0.565\Gamma(f_2(1270)\pi)/\Gamma(\pi^\pm\pi^+\pi^-)$** **$0.565\Gamma_4/(0.565\Gamma_4 + \frac{1}{2}\Gamma_5 + 0.624\Gamma_7)$** (With $f_2(1270) \rightarrow \pi^+\pi^-$.)VALUE **0.604 ± 0.035 OUR FIT**DOCUMENT IDTECNCHGCOMMENT **0.60 ± 0.05 OUR AVERAGE**

Error includes scale factor of 1.3.

 0.61 ± 0.04

24 DAUM

SPEC

 $63,94 \pi^- p$ $0.76 \begin{array}{l} +0.24 \\ -0.34 \end{array}$

ARMENISE 69 DBC

+

 $5.1 \pi^+ d \rightarrow d 3\pi$ 0.35 ± 0.20

BALTAY 68 HBC

+

 $7-8.5 \pi^+ p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

 0.59

BARTSCH 68 HBC

+

 $8 \pi^+ p \rightarrow 3\pi p$ **$0.624\Gamma((\pi\pi)_S\text{-wave})/\Gamma(\pi^\pm\pi^+\pi^-)$** **$0.624\Gamma_7/(0.565\Gamma_4 + \frac{1}{2}\Gamma_5 + 0.624\Gamma_7)$** (With $(\pi\pi)_S\text{-wave} \rightarrow \pi^+\pi^-$.)VALUE **0.10 ± 0.04 OUR FIT**DOCUMENT IDTECNCOMMENT **0.10 ± 0.05**

24 DAUM

SPEC

 $63,94 \pi^- p$ **$\Gamma(K\bar{K}^*(892)+\text{c.c.})/\Gamma(f_2(1270)\pi)$** **$\Gamma_8/\Gamma_4$** VALUE **$0.075 \pm 0.025$ OUR FIT**DOCUMENT IDTECNCHGCOMMENT **0.075 ± 0.025**

25 ARMSTRONG 82B OMEG

-

 $16 \pi^- p \rightarrow K^+ K^- \pi^- p$ **$\Gamma(\omega\rho)/\Gamma_{\text{total}}$**

NODE=M034R13

NODE=M034R13

VALUE **$0.027 \pm 0.004 \pm 0.010$** DOCUMENT IDTECN **$\Gamma_9/\Gamma$**

NODE=M034R17

NODE=M034R17

COMMENT

26 AMELIN 99 VES

CHG $37 \pi^- A \xrightarrow{\omega \pi^- \pi^0} A^*$ $\omega \pi^- \pi^0 A^*$ COMMENT **$\Gamma(\eta\pi)/\Gamma(\pi^\pm\pi^+\pi^-)$** **$\Gamma_{11}/(0.565\Gamma_4 + \frac{1}{2}\Gamma_5 + 0.624\Gamma_7)$** (All η decays.)

NODE=M034R5

NODE=M034R5

NODE=M034R5

VALUE **<0.09** DOCUMENT IDTECNCHGCOMMENT

BALTAY 68 HBC

+

 $7-8.5 \pi^+ p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

 <0.10

CRENNELL 70 HBC

-

 $6 \pi^- p \rightarrow f_2 \pi^- N$

$\Gamma(\pi^\pm 2\pi^+ 2\pi^-)/\Gamma(\pi^\pm \pi^+ \pi^-)$				$\Gamma_{12}/(0.565\Gamma_4 + \frac{1}{2}\Gamma_5 + 0.624\Gamma_7)$			NODE=M034R6 NODE=M034R6;CHECK LIMITS
VALUE	DOCUMENT ID	TECN	CHG	COMMENT			
<0.10	CRENNELL	70	HBC	-	6 $\pi^- p \rightarrow$	$f_2 \pi^- N$	
<0.1	BALTAY	68	HBC	+	7,8.5 $\pi^+ p$		
$\Gamma(\rho(1450)\pi)/\Gamma_{\text{total}}$				Γ_{13}/Γ			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT			
<0.0036	97.7	AMELIN	99	VES	37 $\pi^- A \xrightarrow{\omega \pi^- \pi^0} A^*$		NODE=M034R18 NODE=M034R18
$\Gamma(b_1(1235)\pi)/\Gamma_{\text{total}}$				Γ_{14}/Γ			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT			
<0.0019	97.7	AMELIN	99	VES	37 $\pi^- A \xrightarrow{\omega \pi^- \pi^0} A^*$		NODE=M034R19 NODE=M034R19
$\Gamma(f_1(1285)\pi)/\Gamma_{\text{total}}$				Γ_{16}/Γ			
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT			
possibly seen	69k	KUHN	04	B852	18 $\pi^- p \rightarrow$	$\eta \pi^+ \pi^- \pi^- p$	NODE=M034R23 NODE=M034R23
$\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$				Γ_{17}/Γ			
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT			
not seen	69k	KUHN	04	B852	18 $\pi^- p \rightarrow$	$\eta \pi^+ \pi^- \pi^- p$	NODE=M034R24 NODE=M034R24
D-wave/S-wave RATIO FOR $\pi_2(1670) \rightarrow f_2(1270)\pi$							
VALUE	DOCUMENT ID	TECN	COMMENT				
-0.18±0.06	22 BAKER	99	SPEC	1.94 $\bar{p} p \rightarrow 4\pi^0$			
• • • We do not use the following data for averages, fits, limits, etc. • • •							
0.22±0.10	24 DAUM	81B	SPEC	63,94 $\pi^- p$			
F-wave/P-wave RATIO FOR $\pi_2(1670) \rightarrow \rho\pi$							
VALUE	DOCUMENT ID	TECN	COMMENT				
-0.72±0.07±0.14	CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$			
21 Using BARBERIS 98B. 22 Using preliminary CBAR data. 23 With the $\sigma\pi$ in $L=2$ and the $f_2(1270)\pi$ in $L=0$. 24 From a two-resonance fit to four $2^- 0^+$ waves. 25 From a partial-wave analysis of $K^+ K^- \pi^-$ system. 26 Normalized to the $B(\pi_2(1670) \rightarrow f_2\pi)$.							
$\pi_2(1670)$ REFERENCES							
ALEKSEEV 10	PRL 104 241803	M.G. Alekseev <i>et al.</i>	(COMPASS Collab.)				
SCHEGELSKY 06	EPJ A27 199	V.A. Schegelsky <i>et al.</i>					
LU 05	PRL 94 032002	M. Lu <i>et al.</i>	(BNL E852 Collab.)				
KUHN 04	PL B595 109	J. Kuhn <i>et al.</i>	(BNL E852 Collab.)				
CHUNG 02	PR D65 072001	S.U. Chung <i>et al.</i>	(BNL E852 Collab.)				
BARBERIS 01	PL B507 14	D. Barberis <i>et al.</i>					
AMELIN 99	PAN 62 445	D.V. Amelin <i>et al.</i>	(VES Collab.)				
	Translated from YAF 62 487.						
BAKER 99	PL B449 114	C.A. Baker <i>et al.</i>					
BARBERIS 98B	PL B422 399	D. Barberis <i>et al.</i>	(WA 102 Collab.)				
ACCIARRI 97T	PL B413 147	M. Acciarri <i>et al.</i>	(L3 Collab.)				
ALBRECHT 97B	ZPHY C74 469	H. Albrecht <i>et al.</i>	(ARGUS Collab.)				
AMELIN 95B	PL B356 595	D.V. Amelin <i>et al.</i>	(SERP, TBIL)				
BERDNIKOV 94	PL B337 219	E.B. Berdnikov <i>et al.</i>	(SERP, TBIL)				
ANTREASYAN 90	ZPHY C48 561	D. Antreasyan <i>et al.</i>	(Crystal Ball Collab.)				
BEHREND 90C	ZPHY C46 583	H.J. Behrend <i>et al.</i>	(CELLO Collab.)				
ANTIPOV 87	EPL 4 403	Y.M. Antipov <i>et al.</i>	(SERP, JINR, INRM+)				
BELLINI 85	SJNP 41 781	D. Bellini <i>et al.</i>					
	Translated from YAF 41 1223.						
ARMSTRONG 82B	NP B202 1	T.A. Armstrong, B. Baccari	(AACH3, BARI, BONN+)				
DAUM 81B	NP B182 269	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)				
EVANGELIS... 81	NP B178 197	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)				
Also	NP B186 594	C. Evangelista					
DAUM 80D	PL 89B 285	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+) JP				
BALTAZ 77	PRL 39 591	C. Baltaz, C.V. Cautis, M. Kalelkar	(COLU) JP				
ASCOLI 73	PR D7 669	G. Ascoli	(ILL, TNTO, GENO, HAMB, MILA+) JP				
CRENNELL 70	PRL 24 781	D.J. Crennell <i>et al.</i>	(BNL)				
ARMENISE 69	LNC 2 501	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ)				
BALTAZ 68	PRL 20 887	C. Baltaz <i>et al.</i>	(COLU, ROCH, RUTG, YALE)				
BARTSCH 68	NP B7 345	J. Bartsch <i>et al.</i>	(AACH, BERL, CERN) JP				

NODE=M067

 $\phi(1680)$ $I^G(J^{PC}) = 0^-(1^- -)$ **$\phi(1680)$ MASS** **e^+e^- PRODUCTION**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1680 ± 20 OUR ESTIMATE				
1689 \pm 7	10	4.8k	1 SHEN 09	$BELL\ 10.6\ e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
1709 \pm 20	43		2 AUBERT 08S	$BABR\ 10.6\ e^+e^- \rightarrow \text{hadrons}$
1623 \pm 20	948		3 AKHMETSHIN 03	$CMD2\ 1.05-1.38\ e^+e^- \rightarrow K_L^0K_S^0$
~ 1500			4 ACHASOV 98H	$RVUE\ e^+e^- \rightarrow \pi^+\pi^-\pi^0, \omega\pi^+\pi^-, K^+K^-$
~ 1900			5 ACHASOV 98H	$RVUE\ e^+e^- \rightarrow K_S^0K^\pm\pi^\mp$
1700 \pm 20			6 CLEGG 94	$RVUE\ e^+e^- \rightarrow K^+K^-, K_S^0K\pi$
1657 \pm 27	367		7 BISELLO 91C	$DM2\ e^+e^- \rightarrow K_S^0K^\pm\pi^\mp$
1655 \pm 17			8 BISELLO 88B	$DM2\ e^+e^- \rightarrow K^+K^-$
1680 \pm 10			9 BUON 82	$DM1\ e^+e^- \rightarrow \text{hadrons}$
1677 \pm 12			MANE 82	$DM1\ e^+e^- \rightarrow K_S^0K\pi$

1 From a fit with two incoherent Breit-Wigners.

2 From the simultaneous fit to the $K\bar{K}^*(892) + \text{c.c.}$ and $\phi\eta$ data from AUBERT 08S using the results of AUBERT 07AK.3 From the combined fit of AKHMETSHIN 03 and MANE 81 also including ρ , ω , and ϕ . Neither isospin nor flavor structure known.

4 Using data from IVANOV 81, BARKOV 87, BISELLO 88B, DOLINSKY 91, and ANTONELLI 92.

5 Using the data from BISELLO 91C.

6 Using BISELLO 88B and MANE 82 data.

7 From global fit including ρ , ω , ϕ and $\rho(1700)$ assume mass 1570 MeV and width 510 MeV for ρ radial excitation.8 From global fit of ρ , ω , ϕ and their radial excitations to channels $\omega\pi^+\pi^-$, K^+K^- , $K_L^0K_S^0$, $K_S^0K^\pm\pi^\mp$. Assume mass 1570 MeV and width 510 MeV for ρ radial excitations, mass 1570 and width 500 MeV for ω radial excitation.9 Fit to one channel only, neglecting interference with ω , $\rho(1700)$.**PHOTOPRODUCTION**

VALUE (MeV)		DOCUMENT ID	TECN	COMMENT
We do not use the following data for averages, fits, limits, etc. • • •				
1753 \pm 3		10 LINK 02K	FOCS	$20-160\ \gamma p \rightarrow K^+K^-p$
1726 \pm 22		10 BUSENITZ 89	TPS	$\gamma p \rightarrow K^+K^-X$
1760 \pm 20		10 ATKINSON 85C	OMEG	$20-70\ \gamma p \rightarrow K\bar{K}X$
1690 \pm 10		10 ASTON 81F	OMEG	$25-70\ \gamma p \rightarrow K^+K^-X$

10 We list here a state decaying into K^+K^- possibly different from $\phi(1680)$. **$p\bar{p}$ ANNIHILATION**

VALUE (MeV)		DOCUMENT ID	TECN	COMMENT
We do not use the following data for averages, fits, limits, etc. • • •				
1700 \pm 8		11 AMSLER 06	CBAR	$0.9\ p\bar{p} \rightarrow K^+K^-\pi^0$
11 Could also be $\rho(1700)$.				

 $\phi(1680)$ WIDTH **e^+e^- PRODUCTION**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
150 ± 50 OUR ESTIMATE This is only an educated guess; the error given is larger than the error on the average of the published values.				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
211 \pm 14	19	4.8k 12 SHEN 09	BELL	$10.6\ e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
322 \pm 77	160	13 AUBERT 08S	BABR	$10.6\ e^+e^- \rightarrow \text{hadrons}$
139 \pm 60	948	14 AKHMETSHIN 03	CMD2	$1.05-1.38\ e^+e^- \rightarrow K_L^0K_S^0$
300 \pm 60		15 CLEGG 94	RVUE	$e^+e^- \rightarrow K^+K^-, K_S^0K\pi$
146 \pm 55	367	16 BISELLO 91C	DM2	$e^+e^- \rightarrow K_S^0K^\pm\pi^\mp$
207 \pm 45		17 BISELLO 88B	DM2	$e^+e^- \rightarrow K^+K^-$
185 \pm 22		18 BUON 82	DM1	$e^+e^- \rightarrow \text{hadrons}$
102 \pm 36		MANE 82	DM1	$e^+e^- \rightarrow K_S^0K\pi$

NODE=M067205

NODE=M067M1

NODE=M067M1

→ UNCHECKED ←

OCCUR=4

NODE=M067M1;LINKAGE=SH

NODE=M067M1;LINKAGE=AU

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NODE=M067M1;LINKAGE=L4

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NODE=M067M;LINKAGE=E

NODE=M067M;LINKAGE=C

NODE=M067M;LINKAGE=D

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NODE=M067M2

NODE=M067M2;LINKAGE=LK

NODE=M067M3

NODE=M067M3

NODE=M067M3;LINKAGE=AM

NODE=M067210

NODE=M067W1

NODE=M067W1

→ UNCHECKED ←

- 12 From a fit with two incoherent Breit-Wigners.
 13 From the simultaneous fit to the $K\bar{K}^*(892) + \text{c.c.}$ and $\phi\eta$ data from AUBERT 08S using the results of AUBERT 07AK.
 14 From the combined fit of AKHMETSHIN 03 and MANE 81 also including ρ , ω , and ϕ . Neither isospin nor flavor structure known.
 15 Using BISELLO 88B and MANE 82 data.
 16 From global fit including ρ , ω , ϕ and $\rho(1700)$
 17 From global fit of ρ , ω , ϕ and their radial excitations to channels $\omega\pi^+\pi^-$, K^+K^- , $K_S^0 K_L^0$, $K_S^0 K^\pm\pi^\mp$. Assume mass 1570 MeV and width 510 MeV for ρ radial excitations, mass 1570 and width 500 MeV for ω radial excitation.
 18 Fit to one channel only, neglecting interference with ω , $\rho(1700)$.

PHOTOPRODUCTION

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
122±63	19 LINK	02K	FOCS 20–160 $\gamma p \rightarrow K^+K^-p$
121±47	19 BUSENITZ	89	TPS $\gamma p \rightarrow K^+K^-X$
80±40	19 ATKINSON	85C	OMEG 20–70 $\gamma p \rightarrow K\bar{K}X$
100±40	19 ASTON	81F	OMEG 25–70 $\gamma p \rightarrow K^+K^-X$

19 We list here a state decaying into K^+K^- possibly different from $\phi(1680)$.

p \bar{p} ANNIHILATION

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
143±24	20 AMSLER	06	CBAR 0.9 $\bar{p}p \rightarrow K^+K^-\pi^0$
20 Could also be $\rho(1700)$.			

$\phi(1680)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K\bar{K}^*(892) + \text{c.c.}$	dominant
Γ_2 $K_S^0 K\pi$	seen
Γ_3 $K\bar{K}$	seen
Γ_4 $K_L^0 K_S^0$	
Γ_5 e^+e^-	seen
Γ_6 $\omega\pi\pi$	not seen
Γ_7 $\phi\pi\pi$	
Γ_8 $K^+K^-\pi^+\pi^-$	seen
Γ_9 $\phi\eta$	
Γ_{10} $K^+K^-\pi^0$	

$\phi(1680)\Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

This combination of a branching ratio into channel (i) and branching ratio into e^+e^- is directly measured and obtained from the cross section at the peak. We list only data that have not been used to determine the branching ratio into (i) or e^+e^- .

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

0.131±0.059	948	21 AKHMETSHIN 03	CMD2 1.05–1.38 $e^+e^- \rightarrow K_L^0 K_S^0$	$\Gamma_4/\Gamma \times \Gamma_5/\Gamma$
21 From the combined fit of AKHMETSHIN 03 and MANE 81 also including ρ , ω , and ϕ . Neither isospin nor flavor structure known. Recalculated by us.				

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

1.15±0.16±0.01	22 AUBERT	08S BABR 10.6 $e^+e^- \rightarrow K\bar{K}^*(892)\gamma + \text{c.c.}$	$\Gamma_1/\Gamma \times \Gamma_5/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
3.29±1.57	367 23 BISELLO	91C DM2 1.35–2.40 $e^+e^- \rightarrow K_S^0 K^\pm\pi^\mp$	
22 From the simultaneous fit to the $K\bar{K}^*(892) + \text{c.c.}$ and $\phi\eta$ data from AUBERT 08S using the results of AUBERT 07AK.			
23 Recalculated by us with the published value of $B(K\bar{K}^*(892) + \text{c.c.}) \times \Gamma(e^+e^-)$.			

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NODE=M067W1;LINKAGE=AU

NODE=M067W;LINKAGE=HK

NODE=M067W;LINKAGE=A

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NODE=M067W3

NODE=M067W3

NODE=M067W3;LINKAGE=AM

NODE=M067215;NODE=M067

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 DESIG=5;OUR EST; \rightarrow UNCHECKED
 DESIG=3;OUR EST; \rightarrow UNCHECKED
 DESIG=9
 DESIG=6;OUR EST; \rightarrow UNCHECKED
 DESIG=1;OUR EST; \rightarrow UNCHECKED
 DESIG=11
 DESIG=12;OUR EVAL; \rightarrow UNCHECKED
 DESIG=10
 DESIG=2

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NODE=M067G6

NODE=M067G6

NODE=M067G6;LINKAGE=AU

NODE=M067G;LINKAGE=GL

$\Gamma(\phi\pi\pi)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$				$\Gamma_7/\Gamma \times \Gamma_5/\Gamma$
<u>VALUE</u> (units 10^{-7})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.86 \pm 0.14 \pm 0.21	4.8k	24 SHEN	09 BELL	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
24 Multiplied by 3/2 to take into account the $\phi\pi^0\pi^0$ mode. Using $B(\phi \rightarrow K^+K^-) = (49.2 \pm 0.6)\%$.				
$\Gamma(\phi\eta)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$				$\Gamma_9/\Gamma \times \Gamma_5/\Gamma$
<u>VALUE</u> (units 10^{-6})		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.43 \pm 0.10 \pm 0.09		25 AUBERT	08s BABR	$10.6 e^+e^- \rightarrow \phi\eta\gamma$
25 From the simultaneous fit to the $K\bar{K}^*(892) + \text{c.c.}$ and $\phi\eta$ data from AUBERT 08s using the results of AUBERT 07AK.				

$\phi(1680)$ BRANCHING RATIOS

$\Gamma(K\bar{K}^*(892) + \text{c.c.})/\Gamma(K_S^0 K\pi)$				Γ_1/Γ_2
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
dominant		MANE	82	$e^+e^- \rightarrow K_S^0 K^\pm\pi^\mp$
$\Gamma(K\bar{K})/\Gamma(K\bar{K}^*(892) + \text{c.c.})$				Γ_3/Γ_1
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.07 \pm 0.01		BUON	82	DM1 e^+e^-
$\Gamma(\omega\pi\pi)/\Gamma(K\bar{K}^*(892) + \text{c.c.})$				Γ_6/Γ_1
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.10		BUON	82	DM1 e^+e^-
$\Gamma(\phi\eta)/\Gamma(K\bar{K}^*(892) + \text{c.c.})$				Γ_9/Γ_1
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
≈ 0.37		26 AUBERT	08s BABR	$10.6 e^+e^- \rightarrow \text{hadrons}$
26 From the fit including data from AUBERT 07AK.				

$\phi(1680)$ REFERENCES

SHEN	09	PR D80 031101	C.P. Shen <i>et al.</i>	(BELLE Collab.)
AUBERT	08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
AMSLER	06	PL B639 165	C. Amsler <i>et al.</i>	(CBAR Collab.)
AKHMETSHIN	03	PL B551 27	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
Also		PAN 65 1222	E.V. Anashkin, V.M. Aulchenko, R.R. Akhmetshin	
		Translated from YAF 65 1255.	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
LINK	02K	PL B545 50	N.N. Achasov, A.A. Kozhevnikov	
ACHASOV	98H	PR D57 4334	A.B. Clegg, A. Donnachie	(LANC, MCHS)
CLEGG	94	ZPHY C62 455	A. Antonelli <i>et al.</i>	(DM2 Collab.)
ANTONELLI	92	ZPHY C56 15	D. Bisello <i>et al.</i>	(DM2 Collab.)
BISELLO	91C	ZPHY C52 227	S.I. Dolinsky <i>et al.</i>	(NOVO)
DOLINSKY	91	PRPL 202 99	J.K. Busenitz <i>et al.</i>	(ILL, FNAL)
BUSENITZ	89	PR D40 1	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)
BISELLO	88B	ZPHY C39 13	L.M. Barkov <i>et al.</i>	(NOVO)
BARKOV	87	JETPL 46 164	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
		Translated from ZETFP 46 132.	J. Buon <i>et al.</i>	(LALO, MONP)
ATKINSON	85C	ZPHY C27 233	F. Mane <i>et al.</i>	(LALO)
BUON	82	PL 118B 221	D. Aston <i>et al.</i>	(BONN, CERN, EPOL, GLAS, LANC+)
MANE	82	PL 112B 178	P.M. Ivanov <i>et al.</i>	(NOVO)
ASTON	81F	PL 104B 231	F. Mane <i>et al.</i>	(ORSAY)
IVANOV	81	PL 107B 297		
MANE	81	PL 99B 261		

NODE=M067G01
NODE=M067G01

NODE=M067G01;LINKAGE=SH

NODE=M067G7
NODE=M067G7

NODE=M067G7;LINKAGE=AU

NODE=M067225

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NODE=M067R3

NODE=M067R2
NODE=M067R2

NODE=M067R1
NODE=M067R1

NODE=M067R5
NODE=M067R5

NODE=M067R5;LINKAGE=AU

NODE=M067

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REFID=51908
REFID=51136
REFID=49172
REFID=48827

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REFID=46323
REFID=44081
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REFID=40581
REFID=40280

REFID=21596
REFID=21494
REFID=21590
REFID=21585
REFID=20553
REFID=21588

$\rho_3(1690)$ $I^G(J^{PC}) = 1^+(3^-^-)$

NODE=M015

 $\rho_3(1690)$ MASS

VALUE (MeV)

DOCUMENT ID

1688.8±2.1 OUR AVERAGE Includes data from the 5 datablocks that follow this one. **2π MODE**

VALUE (MeV)

EVTS

DOCUMENT ID

TECN

CHG

COMMENT

The data in this block is included in the average printed for a previous datablock.

NODE=M015205

NODE=M015M

1686± 4 OUR AVERAGE

1677±14		EVANGELIS...	81	OMEG	-	12 $\pi^- p \rightarrow 2\pi p$
1679±11	476	BALTAY	78B	HBC	0	15 $\pi^+ p \rightarrow \pi^+ \pi^- n$
1678±12	175	¹ ANTIPOV	77	CIBS	0	25 $\pi^- p \rightarrow p3\pi$
1690± 7	600	¹ ENGLER	74	DBC	0	6 $\pi^+ n \rightarrow \pi^+ \pi^- p$
1693± 8		² GRAYER	74	ASPK	0	17 $\pi^- p \rightarrow \pi^+ \pi^- n$
1678±12		MATTHEWS	71C	DBC	0	7 $\pi^+ N$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1734±10		³ CORDEN	79	OMEG		12-15 $\pi^- p \rightarrow n2\pi$
1692±12		^{2,4} ESTABROOKS	75	RVUE		17 $\pi^- p \rightarrow \pi^+ \pi^- n$
1737±23		ARMENISE	70	DBC	0	9 $\pi^+ N$
1650±35	122	BARTSCH	70B	HBC	+	8 $\pi^+ p \rightarrow N2\pi$
1687±21		STUNTEBECK	70	HDBC	0	8 $\pi^- p$, 5.4 $\pi^+ d$
1683±13		ARMENISE	68	DBC	0	5.1 $\pi^+ d$
1670±30		GOLDBERG	65	HBC	0	6 $\pi^+ d$, 8 $\pi^- p$

¹ Mass errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.² Uses same data as HYAMS 75.³ From a phase shift solution containing a $f'_2(1525)$ width two times larger than the $K\bar{K}$ result.⁴ From phase-shift analysis. Error takes account of spread of different phase-shift solutions.

NODE=M015M1

NODE=M015M1

 $K\bar{K}$ AND $K\bar{K}\pi$ MODES

VALUE (MeV)

EVTS

DOCUMENT ID

TECN

CHG

COMMENT

The data in this block is included in the average printed for a previous datablock.

NODE=M015M1;LINKAGE=E

NODE=M015M1;LINKAGE=G

NODE=M015M1;LINKAGE=M

NODE=M015M1;LINKAGE=I

NODE=M015M2

NODE=M015M2

1696± 4 OUR AVERAGE

1699± 5		ALPER	80	CNTR	0	62 $\pi^- p \rightarrow K^+ K^- n$
1698±12	6k	^{5,6} MARTIN	78D	SPEC		10 $\pi p \rightarrow K_S^0 K^- p$
1692± 6		BLUM	75	ASPK	0	18.4 $\pi^- p \rightarrow nK^+ K^-$
1690±16		ADERHOLZ	69	HBC	+	8 $\pi^+ p \rightarrow K\bar{K}\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1694± 8		⁷ COSTA...	80	OMEG		10 $\pi^- p \rightarrow K^+ K^- n$

⁵ From a fit to $J^P = 3^-$ partial wave.⁶ Systematic error on mass scale subtracted.⁷ They cannot distinguish between $\rho_3(1690)$ and $\omega_3(1670)$.

NODE=M015M2;LINKAGE=P

NODE=M015M2;LINKAGE=S

NODE=M015M2;LINKAGE=L

(4π) $^\pm$ MODE

VALUE (MeV)

EVTS

DOCUMENT ID

TECN

CHG

COMMENT

The data in this block is included in the average printed for a previous datablock.

NODE=M015M3

NODE=M015M3

1686± 5 OUR AVERAGE Error includes scale factor of 1.1.

1694± 6		⁸ EVANGELIS...	81	OMEG	-	12 $\pi^- p \rightarrow p4\pi$
1665±15	177	BALTAY	78B	HBC	+	15 $\pi^+ p \rightarrow p4\pi$
1670±10		THOMPSON	74	HBC	+	13 $\pi^+ p$
1687±20		CASON	73	HBC	-	8,18.5 $\pi^- p$
1685±14		⁹ CASON	73	HBC	-	8,18.5 $\pi^- p$
1680±40	144	BARTSCH	70B	HBC	+	8 $\pi^+ p \rightarrow N4\pi$
1689±20	102	⁹ BARTSCH	70B	HBC	+	8 $\pi^+ p \rightarrow N2\rho$
1705±21		CASO	70	HBC	-	11.2 $\pi^- p \rightarrow n\rho2\pi$

OCCUR=2

OCCUR=3

• • • We do not use the following data for averages, fits, limits, etc. • • •

1718±10	¹⁰ EVANGELIS...	81	OMEG	—	12 $\pi^- p \rightarrow p 4\pi$	OCCUR=2
1673± 9	¹¹ EVANGELIS...	81	OMEG	—	12 $\pi^- p \rightarrow p 4\pi$	OCCUR=3
1733± 9	66	⁹ KLIGER	74	HBC	—	4.5 $\pi^- p \rightarrow p 4\pi$
1630±15		HOLMES	72	HBC	+	10-12 $K^+ p$
1720±15		BALTAY	68	HBC	+	7, 8.5 $\pi^+ p$

⁸ From $\rho^- \rho^0$ mode, not independent of the other two EVANGELISTA 81 entries.

⁹ From $\rho^\pm \rho^0$ mode.

¹⁰ From $a_2(1320)^- \pi^0$ mode, not independent of the other two EVANGELISTA 81 entries.

¹¹ From $a_2(1320)^0 \pi^-$ mode, not independent of the other two EVANGELISTA 81 entries.

$\omega\pi$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
The data in this block is included in the average printed for a previous datablock.				

1681± 7 OUR AVERAGE

1670±25	¹² ALDE	95	GAM2	38 $\pi^- p \rightarrow \omega \pi^0 n$	
1690±15	EVANGELIS...	81	OMEG	—	12 $\pi^- p \rightarrow \omega \pi p$
1666±14	GESSAROLI	77	HBC	11 $\pi^- p \rightarrow \omega \pi p$	
1686± 9	THOMPSON	74	HBC	+	13 $\pi^+ p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1654±24	BARNHAM	70	HBC	+	10 $K^+ p \rightarrow \omega \pi X$

¹² Supersedes ALDE 92C.

$\eta\pi^+\pi^-$ MODE

(For difficulties with MMS experiments, see the $a_2(1320)$ mini-review in the 1973 edition.)

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
The data in this block is included in the average printed for a previous datablock.				

1682±12 OUR AVERAGE

1685±10±20	AMELIN	00	VES	37 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$	
1680±15	FUKUI	88	SPEC 0	8.95 $\pi^- p \rightarrow \eta \pi^+ \pi^- n$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

1700±47	¹³ ANDERSON	69	MMS	—	16 $\pi^- p$ backward
1632±15	^{13,14} FOCACCI	66	MMS	—	7-12 $\pi^- p \rightarrow p MM$
1700±15	^{13,14} FOCACCI	66	MMS	—	7-12 $\pi^- p \rightarrow p MM$
1748±15	^{13,14} FOCACCI	66	MMS	—	7-12 $\pi^- p \rightarrow p MM$

¹³ Seen in 2.5-3 GeV/c $\bar{p}p$. $2\pi^+ 2\pi^-$, with 0, 1, 2 $\pi^+ \pi^-$ pairs in ρ band not seen by OREN 74 (2.3 GeV/c $\bar{p}p$) with more statistics. (Jan. 1976)

¹⁴ Not seen by BOWEN 72.

NODE=M015M3;LINKAGE=A
NODE=M015M3;LINKAGE=F
NODE=M015M3;LINKAGE=B
NODE=M015M3;LINKAGE=C

NODE=M015M5
NODE=M015M5

NODE=M015M5;LINKAGE=A

NODE=M015M6
NODE=M015M6
NODE=M015M6

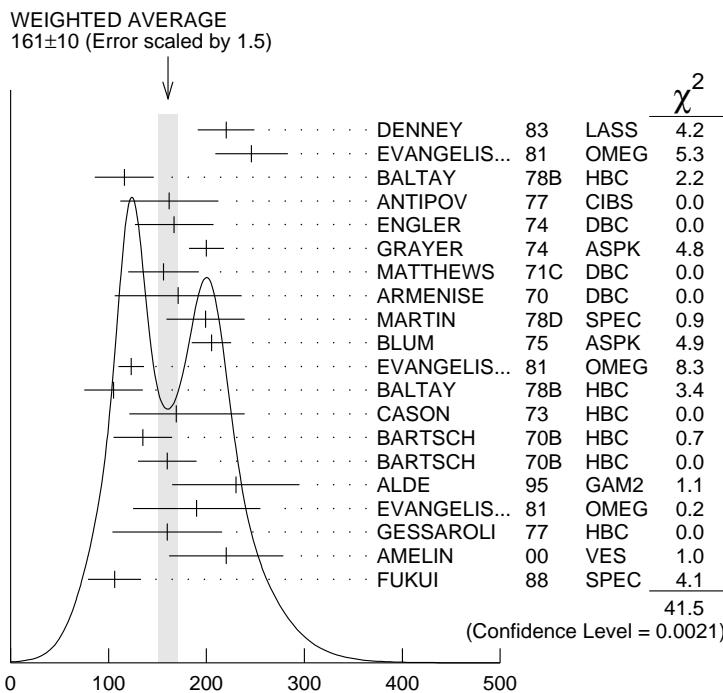
NODE=M015M6;LINKAGE=R

NODE=M015M6;LINKAGE=N

NODE=M015210

NODE=M015W
NODE=M015W

2 π , K \bar{K} , AND K $\bar{K}\pi$ MODES	DOCUMENT ID
161±10 OUR AVERAGE	Includes data from the 5 datablocks that follow this one. Error includes scale factor of 1.5. See the ideogram below.



$\rho_3(1690)$ width, 2π , $K\bar{K}$, and $K\bar{K}\pi$ modes (MeV)

2π MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

NODE=M015W1
NODE=M015W1

186±14 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

220±29		DENNEY	83	LASS	10 $\pi^+ N$
246±37		EVANGELIS...	81	OMEG	— 12 $\pi^- p \rightarrow 2\pi p$
116±30	476	BALTAY	78B	HBC	0 15 $\pi^+ p \rightarrow \pi^+ \pi^- n$
162±50	175	¹⁵ ANTIPOV	77	CIBS	0 25 $\pi^- p \rightarrow p 3\pi$
167±40	600	ENGLER	74	DBC	0 6 $\pi^+ n \rightarrow \pi^+ \pi^- p$
200±18		¹⁶ GRAYER	74	ASPK	0 17 $\pi^- p \rightarrow \pi^+ \pi^- n$
156±36		MATTHEWS	71C	DBC	0 7 $\pi^+ N$
171±65		ARMENISE	70	DBC	0 9 $\pi^+ d$
• • •	We do not use the following data for averages, fits, limits, etc. • • •				
322±35		¹⁷ CORDEN	79	OMEG	12–15 $\pi^- p \rightarrow n 2\pi$
240±30		16,18 ESTABROOKS	75	RVUE	17 $\pi^- p \rightarrow \pi^+ \pi^- n$
180±30	122	BARTSCH	70B	HBC	+ 8 $\pi^+ p \rightarrow N 2\pi$
267 ⁺⁷² ₋₄₆		STUNTEBECK	70	HDBC	0 8 $\pi^- p$, 5.4 $\pi^+ d$
188±49		ARMENISE	68	DBC	0 5.1 $\pi^+ d$
180±40		GOLDBERG	65	HBC	0 6 $\pi^+ d$, 8 $\pi^- p$

¹⁵ Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

¹⁶ Uses same data as HYAMS 75 and BECKER 79.

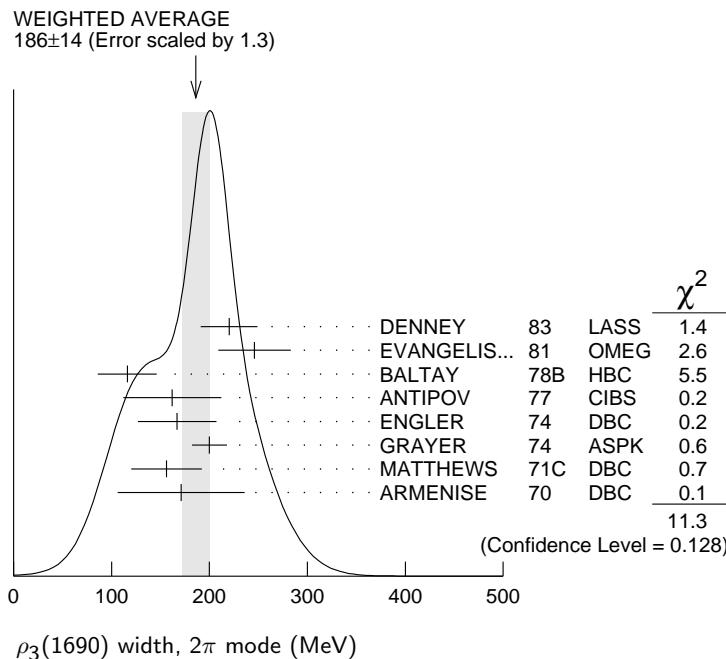
¹⁷ From a phase shift solution containing a $f'_2(1525)$ width two times larger than the $K\bar{K}$ result.

¹⁸ From phase-shift analysis. Error takes account of spread of different phase-shift solutions.

NODE=M015W1;LINKAGE=T
NODE=M015W1;LINKAGE=G

NODE=M015W1;LINKAGE=M

NODE=M015W1;LINKAGE=I



KK AND KKpi MODES

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

NODE=M015W2
NODE=M015W2

204±18 OUR AVERAGE

199±40	6000	19 MARTIN	78D	SPEC	10 $\pi^+ p \rightarrow K_S^0 K^- p$
205±20		BLUM	75	ASPK	0 18.4 $\pi^- p \rightarrow n K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
219±4		ALPER	80	CNTR	0 62 $\pi^- p \rightarrow K^+ K^- n$
186±11		20 COSTA...	80	OMEG	10 $\pi^- p \rightarrow K^+ K^- n$
112±60		ADERHOLZ	69	HBC	+ 8 $\pi^+ p \rightarrow K\bar{K}\pi$

19 From a fit to $J^P = 3^-$ partial wave.

20 They cannot distinguish between $\rho_3(1690)$ and $\omega_3(1670)$.

NODE=M015W2;LINKAGE=P
NODE=M015W2;LINKAGE=L

(4pi)± MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

NODE=M015W3
NODE=M015W3

129±10 OUR AVERAGE

123±13	21	EVANGELIS...	81	OMEG	- 12 $\pi^- p \rightarrow p4\pi$
105±30	177	BALTAY	78B	HBC	+ 15 $\pi^+ p \rightarrow p4\pi$
169±70		CASON	73	HBC	- 8,18.5 $\pi^- p$
135±30	144	BARTSCH	70B	HBC	+ 8 $\pi^+ p \rightarrow N4\pi$
160±30	102	BARTSCH	70B	HBC	+ 8 $\pi^+ p \rightarrow N2\rho$

• • • We do not use the following data for averages, fits, limits, etc. • • •

OCCUR=3

230±28	22	EVANGELIS...	81	OMEG	- 12 $\pi^- p \rightarrow p4\pi$
184±33	23	EVANGELIS...	81	OMEG	- 12 $\pi^- p \rightarrow p4\pi$

OCCUR=2
OCCUR=3

150	66	24 KLIGER	74	HBC	- 4.5 $\pi^- p \rightarrow p4\pi$
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OCCUR=2

106±25		THOMPSON	74	HBC	+ 13 $\pi^+ p$
125±35	24	CASON	73	HBC	- 8,18.5 $\pi^- p$

OCCUR=2

130±30		HOLMES	72	HBC	+ 10–12 $K^+ p$
180±30	90	24 BARTSCH	70B	HBC	+ 8 $\pi^+ p \rightarrow N a_2 \pi$

OCCUR=2

100±35		BALTAY	68	HBC	+ 7, 8.5 $\pi^+ p$
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OCCUR=2

21 From $\rho^- \rho^0$ mode, not independent of the other two EVANGELISTA 81 entries.

NODE=M015W3;LINKAGE=A

22 From $a_2(1320)^-\pi^0$ mode, not independent of the other two EVANGELISTA 81 entries.

NODE=M015W3;LINKAGE=B

23 From $a_2(1320)^0\pi^-$ mode, not independent of the other two EVANGELISTA 81 entries.

NODE=M015W3;LINKAGE=C

24 From $\rho^\pm \rho^0$ mode.

NODE=M015W3;LINKAGE=F

$\omega\pi$ MODEVALUE (MeV)DOCUMENT IDTECNCHGCOMMENT

The data in this block is included in the average printed for a previous datablock.

190±40 OUR AVERAGE

230±65	25 ALDE	95 GAM2	38 $\pi^- p \rightarrow \omega\pi^0 n$
190±65	EVANGELIS...	81 OMEG	— 12 $\pi^- p \rightarrow \omega\pi p$
160±56	GESSAROLI	77 HBC	11 $\pi^- p \rightarrow \omega\pi p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
89±25	THOMPSON	74 HBC	+ 13 $\pi^+ p$
130 ⁺⁷³ ₋₄₃	BARNHAM	70 HBC	+ 10 $K^+ p \rightarrow \omega\pi X$

25 Supersedes ALDE 92C.

NODE=M015W5

NODE=M015W5

 $\eta\pi^+\pi^-$ MODE(For difficulties with MMS experiments, see the $a_2(1320)$ mini-review in the 1973 edition.)VALUE (MeV)DOCUMENT IDTECNCHGCOMMENT

The data in this block is included in the average printed for a previous datablock.

NODE=M015W5;LINKAGE=A

NODE=M015W6

NODE=M015W6

NODE=M015W6

126±40 OUR AVERAGE Error includes scale factor of 1.8.

220±30±50	AMELIN	00 VES	37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$
106±27	FUKUI	88 SPEC	0 8.95 $\pi^- p \rightarrow \eta\pi^+\pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
195	26 ANDERSON	69 MMS	— 16 $\pi^- p$ backward
< 21	26,27 FOCACCI	66 MMS	— 7–12 $\pi^- p \rightarrow p\text{MM}$
< 30	26,27 FOCACCI	66 MMS	— 7–12 $\pi^- p \rightarrow p\text{MM}$
< 38	26,27 FOCACCI	66 MMS	— 7–12 $\pi^- p \rightarrow p\text{MM}$

26 Seen in 2.5–3 GeV/c $\bar{p}p$. $2\pi^+ 2\pi^-$, with 0, 1, 2 $\pi^+ \pi^-$ pairs in ρ^0 band not seen by OREN 74 (2.3 GeV/c $\bar{p}p$) with more statistics. (Jan. 1979)

27 Not seen by BOWEN 72.

OCCUR=2

OCCUR=3

NODE=M015W6;LINKAGE=R

NODE=M015W6;LINKAGE=N

NODE=M015215;NODE=M015

 $\rho_3(1690)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor
$\Gamma_1 4\pi$	(71.1 ± 1.9) %	
$\Gamma_2 \pi^\pm \pi^+ \pi^- \pi^0$	(67 ± 22) %	
$\Gamma_3 \omega\pi$	(16 ± 6) %	
$\Gamma_4 \pi\pi$	(23.6 ± 1.3) %	
$\Gamma_5 K\bar{K}\pi$	(3.8 ± 1.2) %	
$\Gamma_6 K\bar{K}$	(1.58 ± 0.26) %	1.2
$\Gamma_7 \eta\pi^+\pi^-$	seen	
$\Gamma_8 \rho(770)\eta$	seen	
$\Gamma_9 \pi\pi\rho$	seen	
Excluding 2ρ and $a_2(1320)\pi$.		
$\Gamma_{10} a_2(1320)\pi$	seen	
$\Gamma_{11} \rho\rho$	seen	
$\Gamma_{12} \phi\pi$		
$\Gamma_{13} \eta\pi$		
$\Gamma_{14} \pi^\pm 2\pi^+ 2\pi^- \pi^0$		

DESIG=2

DESIG=11

DESIG=7

DESIG=1

DESIG=3

DESIG=4

DESIG=13

DESIG=14;OUR EST;→ UNCHECKED ←
DESIG=5;OUR EST;→ UNCHECKED ←DESIG=6;OUR EST;→ UNCHECKED ←
DESIG=8;OUR EST;→ UNCHECKED ←

DESIG=9

DESIG=10

DESIG=12

CONSTRAINED FIT INFORMATION

An overall fit to 5 branching ratios uses 10 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 = 14.7$ for 7 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_4	-77			
x_5	-74	17		
x_6	-15	2	0	
	x_1	x_4	x_5	

$\rho_3(1690)$ BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$

VALUE

0.236 ± 0.013 OUR FIT

0.243 ± 0.013 OUR AVERAGE

	DOCUMENT ID	TECN	CHG	COMMENT	Γ_4/Γ
0.259 ^{+0.018} -0.019	BECKER	79	ASPK	0	17 $\pi^- p$ polarized
0.23 ± 0.02	CORDEN	79	OMEG		12–15 $\pi^- p \rightarrow n 2\pi$
0.22 ± 0.04	²⁸ MATTHEWS	71C	HDBC	0	7 $\pi^+ n \rightarrow \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.245 ± 0.006	²⁹ ESTABROOKS	75	RVUE		17 $\pi^- p \rightarrow \pi^+ \pi^- n$

28 One-pion-exchange model used in this estimation.

29 From phase-shift analysis of HYAMS 75 data.

NODE=M015220

NODE=M015R1

NODE=M015R1

$\Gamma(\pi\pi)/\Gamma(\pi^\pm \pi^+ \pi^- \pi^0)$

VALUE

0.35 ± 0.11

• • • We do not use the following data for averages, fits, limits, etc. • • •

	DOCUMENT ID	TECN	CHG	COMMENT	Γ_4/Γ_2
<0.2	CASON	73	HBC	-	8,18.5 $\pi^- p$
<0.12	HOLMES	72	HBC	+	10–12 $K^+ p$
	BALLAM	71B	HBC	-	16 $\pi^- p$

NODE=M015R1;LINKAGE=P

NODE=M015R1;LINKAGE=G

NODE=M015R2

NODE=M015R2

$\Gamma(\pi\pi)/\Gamma(4\pi)$

VALUE

0.332 ± 0.026 OUR FIT Error includes scale factor of 1.1.

0.30 ± 0.10

	DOCUMENT ID	TECN	CHG	COMMENT	Γ_4/Γ_1
	BALTAY	78B	HBC	0	15 $\pi^+ p \rightarrow p 4\pi$

NODE=M015R3

NODE=M015R3

$\Gamma(K\bar{K})/\Gamma(\pi\pi)$

VALUE

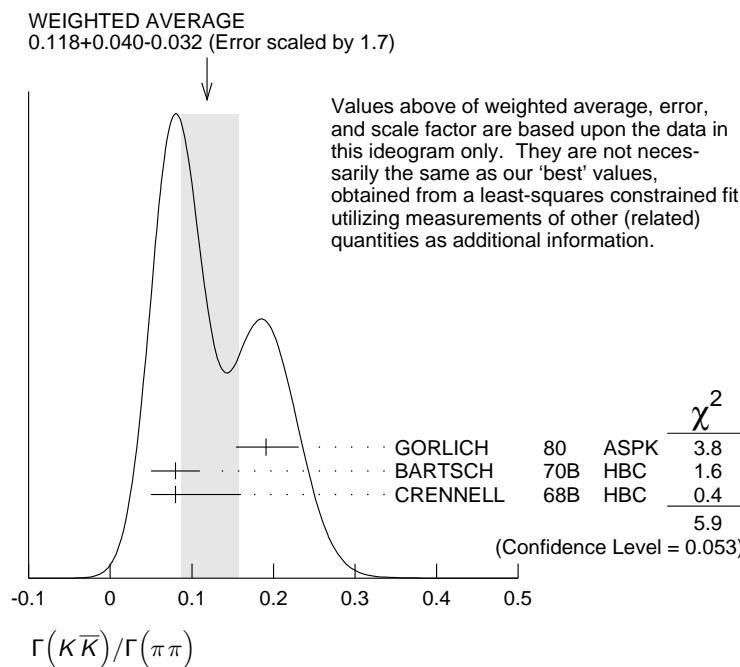
0.067 ± 0.011 OUR FIT Error includes scale factor of 1.2.

**0.118^{+0.040}
-0.032 OUR AVERAGE** Error includes scale factor of 1.7. See the ideogram below.

	DOCUMENT ID	TECN	CHG	COMMENT	Γ_6/Γ_4
0.191 ^{+0.040} -0.037	GORLICH	80	ASPK	0	17,18 $\pi^- p$ polarized
0.08 ± 0.03	BARTSCH	70B	HBC	+	8 $\pi^+ p$
0.08 ^{+0.08} -0.03	CRENNELL	68B	HBC		6.0 $\pi^- p$

NODE=M015R4

NODE=M015R4



$\Gamma(K\bar{K}\pi)/\Gamma(\pi\pi)$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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0.16±0.05 OUR FIT

0.16±0.05

DOCUMENT ID	TECN	CHG	COMMENT
30 BARTSCH	70B HBC	+	$8 \pi^+ p$

30 Increased by us to correspond to $B(p_3(1690) \rightarrow \pi\pi) = 0.24$.

Γ_5/Γ_4

NODE=M015R5
NODE=M015R5

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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0.94±0.09 OUR AVERAGE

0.96 ± 0.21

0.88 ± 0.15

1 ± 0.15

consistent with 1

DOCUMENT ID	TECN	CHG	COMMENT
BALTAY 78B	HBC	+	$15 \pi^+ p \rightarrow p4\pi$
BALLAM 71B	HBC	-	$16 \pi^- p$
BARTSCH 70B	HBC	+	$8 \pi^+ p$
CASO 68	HBC	-	$11 \pi^- p$

$\Gamma(\rho\rho)/\Gamma(\pi^\pm\pi^+\pi^-\pi^0)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.12 ± 0.11

0.56

0.13 ± 0.09

0.7 ± 0.15

DOCUMENT ID	TECN	CHG	COMMENT
BALTAY 78B	HBC	+	$15 \pi^+ p \rightarrow p4\pi$
KLIGER 74	HBC	-	$4.5 \pi^- p \rightarrow p4\pi$
THOMPSON 74	HBC	+	$13 \pi^+ p$
BARTSCH 70B	HBC	+	$8 \pi^+ p$

31 $\rho\rho$ and $a_2(1320)\pi$ modes are indistinguishable.

Γ_{11}/Γ_2

NODE=M015R7
NODE=M015R7

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.48 ± 0.16

DOCUMENT ID	TECN	CHG	COMMENT
CASO 68	HBC	-	$11 \pi^- p$

$\Gamma(a_2(1320)\pi)/\Gamma(\pi^\pm\pi^+\pi^-\pi^0)$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.66 ± 0.08

0.36 ± 0.14

not seen

0.6 ± 0.15

0.6

DOCUMENT ID	TECN	CHG	COMMENT
BALTAY 78B	HBC	+	$15 \pi^+ p \rightarrow p4\pi$
THOMPSON 74	HBC	+	$13 \pi^+ p$
CASON 73	HBC	-	$8,18.5 \pi^- p$
BARTSCH 70B	HBC	+	$8 \pi^+ p$
BALTAY 68	HBC	+	$7,8.5 \pi^+ p$

32 $\rho\rho$ and $a_2(1320)\pi$ modes are indistinguishable.

Γ_{10}/Γ_2

NODE=M015R9
NODE=M015R9

NODE=M015R9;LINKAGE=T

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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VALUE	DOCUMENT ID	TECN	CHG	COMMENT
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$\Gamma(\omega\pi)/\Gamma(\pi^\pm\pi^+\pi^-\pi^0)$

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
0.23±0.05 OUR AVERAGE					
0.33±0.07		THOMPSON 74	HBC	+	13 $\pi^+ p$
0.12±0.07		BALLAM 71B	HBC	-	16 $\pi^- p$
0.25±0.10		BALTAY 68	HBC	+	7.8.5 $\pi^+ p$
0.25±0.10		JOHNSTON 68	HBC	-	7.0 $\pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.11	95	BALTAY	78B	HBC	+ 15 $\pi^+ p \rightarrow p4\pi$
<0.09		KLIGER	74	HBC	- 4.5 $\pi^- p \rightarrow p4\pi$

NODE=M015R10
NODE=M015R10 $\Gamma(\phi\pi)/\Gamma(\pi^\pm\pi^+\pi^-\pi^0)$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.11	BALTAY	68	HBC	+ 7.8.5 $\pi^+ p$

NODE=M015R11
NODE=M015R11 $\Gamma(\pi^\pm 2\pi^+ 2\pi^- \pi^0)/\Gamma(\pi^\pm\pi^+\pi^-\pi^0)$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.15	BALTAY	68	HBC	+ 7.8.5 $\pi^+ p$

NODE=M015R12
NODE=M015R12 $\Gamma(\eta\pi)/\Gamma(\pi^\pm\pi^+\pi^-\pi^0)$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.02	THOMPSON 74	HBC	+	13 $\pi^+ p$

NODE=M015R13
NODE=M015R13 $\Gamma(K\bar{K})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.0158±0.0026 OUR FIT Error includes scale factor of 1.2.				
0.0130±0.0024 OUR AVERAGE				
0.013 ± 0.003	COSTA...	80	OMEG 0	10 $\pi^- p \rightarrow K^+ K^- n$
0.013 ± 0.004	33 MARTIN	78B	SPEC	- 10 $\pi p \rightarrow K_S^0 K^- p$

NODE=M015R14
NODE=M015R1433 From $(\Gamma_4\Gamma_6)^{1/2} = 0.056 \pm 0.034$ assuming $B(\rho_3(1690) \rightarrow \pi\pi) = 0.24$.

NODE=M015R14;LINKAGE=B

 $\Gamma(\omega\pi)/[\Gamma(\omega\pi) + \Gamma(\rho\rho)]$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.22±0.08	CASON	73	HBC	- 8.18.5 $\pi^- p$

NODE=M015R16
NODE=M015R16 $\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
seen			
FUKUI	88	SPEC	8.95 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

NODE=M015R17
NODE=M015R17 $\Gamma(a_2(1320)\pi)/\Gamma(\rho(770)\eta)$

VALUE	DOCUMENT ID	TECN	COMMENT
5.5±2.0	AMELIN	00	VES 37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

NODE=M015R18
NODE=M015R18 $\rho_3(1690)$ REFERENCES

AMELIN	00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)
ALDE	95	ZPHY C66 379	D.M. Alde <i>et al.</i>	(GAMS Collab.) JP
ALDE	92C	ZPHY C54 553	D.M. Alde <i>et al.</i>	(BELG, SERP, KEK, LANL+)
FUKUI	88	PL B202 441	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)
DENNEY	83	PR D28 2726	D.L. Denney <i>et al.</i>	(IOWA, MICH)
EVANGELIS...	81	NP B178 197	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)
ALPER	80	PL 94B 422	B. Alper <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)
COSTA...	80	NP B175 402	G. Costa de Beauregard <i>et al.</i>	(BARI, BONN+)
GORLICH	80	NP B174 16	L. Gorlich <i>et al.</i>	(CRAC, MPIM, CERN+)
BECKER	79	NP B151 46	H. Becker <i>et al.</i>	(MPIM, CERN, ZEEM, CRAC)
CORDEN	79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+) JP
BALTAY	78B	PR D17 62	C. Baltay <i>et al.</i>	(COLU, BING)
MARTIN	78B	NP B140 158	A.D. Martin <i>et al.</i>	(DURH, GEVA)
MARTIN	78D	PL 74B 417	A.D. Martin <i>et al.</i>	(DURH, GEVA)
ANTIPOV	77	NP B119 45	Y.M. Antipov <i>et al.</i>	(SERP, GEVA)
GESSAROLI	77	NP B126 382	R. Gessaroli <i>et al.</i>	(BGNA, FIRZ, GENO+)
BLUM	75	PL 57B 403	W. Blum <i>et al.</i>	(CERN, MPIM) JP
ESTABROOKS	75	NP B95 322	P.G. Estabrooks, A.D. Martin	(DURH)
HYAMS	75	NP B100 205	B.D. Hyams <i>et al.</i>	(CERN, MPIM)
ENGLER	74	PR D10 2070	A. Engler <i>et al.</i>	(CMU, CASE)

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REFID=21272
REFID=20728
REFID=20230
REFID=21651
REFID=20642
REFID=20355
REFID=20110

GRAYER	74	NP B75 189	G. Grayer <i>et al.</i>	(CERN, MPIM)	REFID=20113
KLIGER	74	SJNP 19 428	G.K. Klinger <i>et al.</i>	(ITEP)	REFID=21648
		Translated from YAF 19	839		
OREN	74	NP B71 189	Y. Oren <i>et al.</i>	(ANL, OXF)	REFID=20221
THOMPSON	74	NP B69 220	G. Thompson <i>et al.</i>	(PURD)	REFID=21650
CASON	73	PR D7 1971	N.M. Cason <i>et al.</i>	(NDAM)	REFID=20606
BOWEN	72	PRC 29 890	D.R. Bowen <i>et al.</i>	(NEAS, STON)	REFID=21711
HOLMES	72	PR D6 3336	R. Holmes <i>et al.</i>	(ROCH)	REFID=21639
BALLAM	71B	PR D3 2606	J. Ballam <i>et al.</i>	(SLAC)	REFID=21630
MATTHEWS	71C	NP B33 1	J.A.J. Matthews <i>et al.</i>	(TNTO, WISC) JP	REFID=21633
ARMENISE	70	LNC 4 199	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ)	REFID=20693
BARNHAM	70	PRC 24 1083	K.W.J. Barnham <i>et al.</i>	(BIRM)	REFID=21624
BARTSCH	70B	NP B22 109	J. Bartsch <i>et al.</i>	(AACH, BERL, CERN)	REFID=21625
CASO	70	LNC 3 707	C. Caso <i>et al.</i>	(GENO, HAMB, MILA, SACL)	REFID=20590
STUNTEBECK	70	PL 32B 391	P.H. Stuntebeck <i>et al.</i>	(NDAM)	REFID=20696
ADERHOLZ	69	NP B11 259	M. Aderholz <i>et al.</i>	(AACH3, BERL, CERN+)	REFID=20687
ANDERSON	69	PRL 22 1390	E.W. Anderson <i>et al.</i>	(BNL, CMU)	REFID=20795
ARMENISE	68	NC 54A 999	N. Armenise <i>et al.</i>	(BARI, BGNA, FIRZ+) I	REFID=20054
BALTAZ	68	PRL 20 887	C. Baltaz <i>et al.</i>	(COLU, ROCH, RUTG, YALE) I	REFID=21531
CASO	68	NC 54A 983	C. Caso <i>et al.</i>	(GENO, HAMB, MILA, SACL)	REFID=20586
CRENNELL	68B	PL 28B 136	D.J. Crennell <i>et al.</i>	(BNL)	REFID=21616
JOHNSTON	68	PRL 20 1414	T.F. Johnston <i>et al.</i>	(TNTO, WISC) IJP	REFID=21617
FOCACCI	66	PRL 17 890	M.N. Focacci <i>et al.</i>	(CERN)	REFID=20402
GOLDBERG	65	PL 17 354	M. Goldberg <i>et al.</i>	(CERN, EPOL, ORSAY+)	REFID=21601

 $\rho(1700)$

$I^G(J^{PC}) = 1^+(1^{--})$

A REVIEW GOES HERE – Check our WWW List of Reviews

 $\rho(1700)$ MASS **$\eta\rho^0$ AND $\pi^+\pi^-$ MODES**VALUE (MeV)DOCUMENT ID**1720±20 OUR ESTIMATE** **$\eta\rho^0$ MODE**VALUE (MeV)DOCUMENT IDTECNCOMMENT

The data in this block is included in the average printed for a previous datablock.

• • • We do not use the following data for averages, fits, limits, etc. • • •

1740±20		ANTONELLI	88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
1701±15		¹ FUKUI	88	SPEC	$8.95\pi^-p \rightarrow \eta\pi^+\pi^-$

¹ Assuming $\rho^+ f_0(1370)$ decay mode interferes with $a_1(1260)^+\pi^-$ background. From a two Breit-Wigner fit.

NODE=M065

 $\pi\pi$ MODEVALUE (MeV)EVTSDOCUMENT IDTECNCOMMENT

The data in this block is included in the average printed for a previous datablock.

• • • We do not use the following data for averages, fits, limits, etc. • • •

1780	± 20	$^{+15}_{-20}$	63.5k	² ABRAMOWICZ	12 ZEUS $e p \rightarrow e\pi^+\pi^-p$
1861	± 17			³ LEES	12G BABR $e^+e^- \rightarrow \pi^+\pi^-\gamma$
1728	± 17	± 89	5.4M	^{4,5} FUJIKAWA	08 BELL $\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
1780	± 37	± 29		⁶ ABELE	97 CBAR $\bar{p}n \rightarrow \pi^-\pi^0\pi^0$
1719	± 15			⁶ BERTIN	97C OBLX $0.0\bar{p}p \rightarrow \pi^+\pi^-\pi^0$
1730	± 30			CLEGG	94 RVUE $e^+e^- \rightarrow \pi^+\pi^-$
1768	± 21			BISELLO	89 DM2 $e^+e^- \rightarrow \pi^+\pi^-$
1745.7	± 91.9			DUBNICKA	89 RVUE $e^+e^- \rightarrow \pi^+\pi^-$
1546	± 26			GESHKEN...	89 RVUE
1650				⁷ ERKAL	85 RVUE $20-70\gamma p \rightarrow \gamma\pi^-$
1550	± 70			ABE	84B HYBR $20\gamma p \rightarrow \pi^+\pi^-p$
1590	± 20			⁸ ASTON	80 OMEG $20-70\gamma p \rightarrow p2\pi$
1600	± 10			⁹ ATIYA	79B SPEC $50\gamma C \rightarrow C2\pi$
1598	± 24	± 22		BECKER	79 ASPK $17\pi^-p$ polarized
1659	± 25			⁷ LANG	79 RVUE
1575				⁷ MARTIN	78C RVUE $17\pi^-p \rightarrow \pi^+\pi^-n$
1610	± 30			⁷ FROGGATT	77 RVUE $17\pi^-p \rightarrow \pi^+\pi^-n$
1590	± 20			¹⁰ HYAMS	73 ASPK $17\pi^-p \rightarrow \pi^+\pi^-n$

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NODE=M065M0

→ UNCHECKED ←

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NODE=M065M;LINKAGE=B

NODE=M065M1

NODE=M065M1

- 2 Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho - \omega$ interference.
 3 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.
 4 $|F_\pi(0)|^2$ fixed to 1.
 5 From the GOUNARIS 68 parametrization of the pion form factor.
 6 T-matrix pole.
 7 From phase shift analysis of HYAMS 73 data.
 8 Simple relativistic Breit-Wigner fit with constant width.
 9 An additional 40 MeV uncertainty in both the mass and width is present due to the choice of the background shape.
 10 Included in BECKER 79 analysis.

 $\pi\omega$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1550 to 1620	11 ACHASOV	00I	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
1580 to 1710	12 ACHASOV	00I	SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
1710±90	ACHASOV	97	RVUE	$e^+ e^- \rightarrow \omega \pi^0$
11 Taking into account both $\rho(1450)$ and $\rho(1700)$ contributions. Using the data of ACHASOV 00I on $e^+ e^- \rightarrow \omega \pi^0$ and of EDWARDS 00A on $\tau^- \rightarrow \omega \pi^- \nu_\tau$. $\rho(1450)$ mass and width fixed at 1400 MeV and 500 MeV respectively.				
12 Taking into account the $\rho(1700)$ contribution only. Using the data of ACHASOV 00I on $e^+ e^- \rightarrow \omega \pi^0$ and of EDWARDS 00A on $\tau^- \rightarrow \omega \pi^- \nu_\tau$.				

 $K\bar{K}$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1740.8±22.2	27k	13 ABELE	99D	CBAR	\pm 0.0 $\bar{p} p \rightarrow K^+ K^- \pi^0$
1582 ± 36	1600	CLELAND	82B	SPEC	\pm 50 $\pi p \rightarrow K_S^0 K^\pm p$

13 K-matrix pole. Isospin not determined, could be $\omega(1650)$ or $\phi(1680)$.

 $2(\pi^+\pi^-)$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1851 + 27 - 24		ACHASOV	97	RVUE	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
1570 ± 20		14 CORDIER	82	DM1	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
1520 ± 30		15 ASTON	81E	OMEG	20–70 $\gamma p \rightarrow p4\pi$
1654 ± 25		16 DIBIANCA	81	DBC	$\pi^+ d \rightarrow pp2(\pi^+ \pi^-)$
1666 ± 39		14 BACCI	80	FRAG	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
1780	34	KILLIAN	80	SPEC	11 $e^- p \rightarrow 2(\pi^+ \pi^-)$
1500		17 ATIYA	79B	SPEC	50 $\gamma C \rightarrow C4\pi^\pm$
1570 ± 60	65	18 ALEXANDER	75	HBC	7.5 $\gamma p \rightarrow p4\pi$
1550 ± 60		15 CONVERSI	74	OSPK	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
1550 ± 50	160	SCHACHT	74	STRC	5.5–9 $\gamma p \rightarrow p4\pi$
1450 ± 100	340	SCHACHT	74	STRC	9–18 $\gamma p \rightarrow p4\pi$
1430 ± 50	400	BINGHAM	72B	HBC	9.3 $\gamma p \rightarrow p4\pi$

14 Simple relativistic Breit-Wigner fit with model dependent width.

15 Simple relativistic Breit-Wigner fit with constant width.

16 One peak fit result.

17 Parameters roughly estimated, not from a fit.

18 Skew mass distribution compensated by Ross-Stodolsky factor.

 $\pi^+\pi^-\pi^0$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1660±30	ATKINSON	85B	OMEG	20–70 γp
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3($\pi^+\pi^-$) AND 2($\pi^+\pi^-\pi^0$) MODES

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1730±34	19 FRABETTI	04	E687	$\gamma p \rightarrow 3\pi^+ 3\pi^- p$
1783±15	CLEGG	90	RVUE	$e^+ e^- \rightarrow 3(\pi^+ \pi^-)2(\pi^+ \pi^- \pi^0)$

19 From a fit with two resonances with the JACOB 72 continuum.

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NODE=M065M;LINKAGE=PI

$\rho(1700)$ WIDTH **$\eta\rho^0$ AND $\pi^+\pi^-$ MODES**

VALUE (MeV)

250±100 OUR ESTIMATE

DOCUMENT ID

NODE=M065210

NODE=M065W0

NODE=M065W0

→ UNCHECKED ←

 $\eta\rho^0$ MODE

VALUE (MeV)

DOCUMENT ID

TECN

COMMENT

NODE=M065W6

NODE=M065W6

The data in this block is included in the average printed for a previous datablock.

• • • We do not use the following data for averages, fits, limits, etc. • • •

150±30	ANTONELLI	88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
282±44	20 FUKUI	88	SPEC	$8.95\pi^-p \rightarrow \eta\pi^+\pi^-n$
20 Assuming $\rho^+f_0(1370)$ decay mode interferes with $a_1(1260)^+\pi^-$ background. From a two Breit-Wigner fit.				

NODE=M065W;LINKAGE=B

 $\pi\pi$ MODE

VALUE (MeV)

EVTS

DOCUMENT ID

TECN

COMMENT

NODE=M065W1

NODE=M065W1

The data in this block is included in the average printed for a previous datablock.

• • • We do not use the following data for averages, fits, limits, etc. • • •

310 ± 30	+25 -35	63.5k	21 ABRAMOWICZ12	ZEUS	$ep \rightarrow e\pi^+\pi^-p$
316 ± 26			22 LEES	12G BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
164 ± 21	+89 -26	5.4M	23,24 FUJIKAWA	08 BELL	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
275 ± 45			25 ABELE	97 CBAR	$\bar{p}n \rightarrow \pi^-\pi^0\pi^0$
310 ± 40			25 BERTIN	97C OBLX	$0.0\bar{p}p \rightarrow \pi^+\pi^-\pi^-$
400 ± 100			CLEGG	94 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
224 ± 22			BISELLO	89 DM2	$e^+e^- \rightarrow \pi^+\pi^-$
242.5±163.0			DUBNICKA	89 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
620 ± 60			GESHKEN...	89 RVUE	
<315			26 ERKAL	85 RVUE	20–70 $\gamma p \rightarrow \gamma\pi$
280 ± 30	-80		ABE	84B HYBR	20 $\gamma p \rightarrow \pi^+\pi^-p$
230 ± 80			27 ASTON	80 OMEG	20–70 $\gamma p \rightarrow p2\pi$
283 ± 14			28 ATIYA	79B SPEC	50 $\gamma C \rightarrow C2\pi$
175 ± 98	-53		BECKER	79 ASPK	17 π^-p polarized
232 ± 34			26 LANG	79 RVUE	
340			26 MARTIN	78C RVUE	17 $\pi^-p \rightarrow \pi^+\pi^-n$
300 ± 100			26 FROGGATT	77 RVUE	17 $\pi^-p \rightarrow \pi^+\pi^-n$
180 ± 50			29 HYAMS	73 ASPK	17 $\pi^-p \rightarrow \pi^+\pi^-n$

21 Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho-\omega$ interference.22 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.23 $|F_\pi(0)|^2$ fixed to 1.

24 From the GOUNARIS 68 parametrization of the pion form factor.

25 T-matrix pole.

26 From phase shift analysis of HYAMS 73 data.

27 Simple relativistic Breit-Wigner fit with constant width.

28 An additional 40 MeV uncertainty in both the mass and width is present due to the choice of the background shape.

29 Included in BECKER 79 analysis.

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NODE=M065W;LINKAGE=H

NODE=M065W2
NODE=M065W2

VALUE (MeV)

EVTS

DOCUMENT ID

TECN

CHG

COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

187.2±26.7	27k	30 ABELE	99D CBAR	± 0.0 $\bar{p}p \rightarrow K^+K^-\pi^0$
265 ± 120	1600	CLELAND	82B SPEC	± 50 $\pi p \rightarrow K_S^0K^\pm p$

30 K-matrix pole. Isospin not determined, could be $\omega(1650)$ or $\phi(1680)$.

NODE=M065W2;LINKAGE=AN

2 ($\pi^+ \pi^-$) MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
510 ± 40		31 CORDIER	82 DM1	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
400 ± 50		32 ASTON	81E OMEG	$20\text{--}70 \gamma p \rightarrow p4\pi$
400 ± 146		33 DIBIANCA	81 DBC	$\pi^+ d \rightarrow pp2(\pi^+ \pi^-)$
700 ± 160		31 BACCI	80 FRAG	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
100	34	KILLIAN	80 SPEC	$11 e^- p \rightarrow 2(\pi^+ \pi^-)$
600		34 ATIYA	79B SPEC	$50 \gamma C \rightarrow C4\pi^\pm$
340 ± 160	65	35 ALEXANDER	75 HBC	$7.5 \gamma p \rightarrow p4\pi$
360 ± 100		32 CONVERSI	74 OSPK	$e^+ e^- \rightarrow 2(\pi^+ \pi^-)$
400 ± 120	160	36 SCHACHT	74 STRC	$5.5\text{--}9 \gamma p \rightarrow p4\pi$
850 ± 200	340	36 SCHACHT	74 STRC	$9\text{--}18 \gamma p \rightarrow p4\pi$
650 ± 100	400	BINGHAM	72B HBC	$9.3 \gamma p \rightarrow p4\pi$

31 Simple relativistic Breit-Wigner fit with model-dependent width.

32 Simple relativistic Breit-Wigner fit with constant width.

33 One peak fit result.

34 Parameters roughly estimated, not from a fit.

35 Skew mass distribution compensated by Ross-Stodolsky factor.

36 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

NODE=M065W4
NODE=M065W4

OCCUR=2

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NODE=M065W;LINKAGE=O
NODE=M065W;LINKAGE=C
NODE=M065W;LINKAGE=D
NODE=M065W;LINKAGE=E

NODE=M065W5
NODE=M065W5

$\pi^+ \pi^- \pi^0 \pi^0$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
300 ± 50	ATKINSON	85B OMEG	20–70 γp

$\omega \pi^0$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
350 to 580	37 ACHASOV	00I SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
490 to 1040	38 ACHASOV	00I SND	$e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
37 Taking into account both $\rho(1450)$ and $\rho(1700)$ contributions. Using the data of ACHASOV 00I on $e^+ e^- \rightarrow \omega \pi^0$ and of EDWARDS 00A on $\tau^- \rightarrow \omega \pi^- \nu_\tau$. $\rho(1450)$ mass and width fixed at 1400 MeV and 500 MeV respectively.			
38 Taking into account the $\rho(1700)$ contribution only. Using the data of ACHASOV 00I on $e^+ e^- \rightarrow \omega \pi^0$ and of EDWARDS 00A on $\tau^- \rightarrow \omega \pi^- \nu_\tau$.			

NODE=M065W9
NODE=M065W9

OCCUR=2

NODE=M065W;LINKAGE=I1

NODE=M065W;LINKAGE=I2

3($\pi^+ \pi^-$) AND 2($\pi^+ \pi^- \pi^0$) MODES

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
315 ± 100	39 FRABETTI	04 E687	$\gamma p \rightarrow 3\pi^+ 3\pi^- p$
285 ± 20	CLEGG	90 RVUE	$e^+ e^- \rightarrow 3(\pi^+ \pi^-)2(\pi^+ \pi^- \pi^0)$
39 From a fit with two resonances with the JACOB 72 continuum.			

NODE=M065W7
NODE=M065W7

NODE=M065W;LINKAGE=PI

NODE=M065215;NODE=M065

Mode	Fraction (Γ_i/Γ)
Γ_1	4π
Γ_2	$2(\pi^+ \pi^-)$
Γ_3	$\rho \pi \pi$
Γ_4	$\rho^0 \pi^+ \pi^-$
Γ_5	$\rho^0 \pi^0 \pi^0$
Γ_6	$\rho^\pm \pi^\mp \pi^0$
Γ_7	$a_1(1260)\pi$
Γ_8	$h_1(1170)\pi$
Γ_9	$\pi(1300)\pi$
Γ_{10}	$\rho\rho$
Γ_{11}	$\pi^+ \pi^-$
Γ_{12}	$\pi\pi$
Γ_{13}	$K\bar{K}^*(892) + c.c.$
Γ_{14}	$\eta\rho$
Γ_{15}	$a_2(1320)\pi$
Γ_{16}	$K\bar{K}$
Γ_{17}	$e^+ e^-$
Γ_{18}	$\pi^0 \omega$

DESIG=20

DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=12;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=7

DESIG=9;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=15;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=16;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=17;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=18;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=4;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=13;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=10;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=11;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=14;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=5;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=8;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=6;OUR EST; \rightarrow UNCHECKED \leftarrow

$\rho(1700) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

This combination of a partial width with the partial width into $e^+ e^-$ and with the total width is obtained from the cross-section into channel in $e^+ e^-$ annihilation.

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_{17}/\Gamma$		
<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.6 ± 0.2	DELCOURT	81B DM1	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
2.83 ± 0.42	BACCI	80 FRAG	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$

$\Gamma(\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{11}\Gamma_{17}/\Gamma$		
<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.13	40 DIEKMAN	88 RVUE	$e^+ e^- \rightarrow \pi^+\pi^-$
0.029 ± 0.016	KURDADZE	83 OLYA	0.64–1.4 $e^+ e^- \rightarrow \pi^+\pi^-$

40 Using total width = 220 MeV.

$\Gamma(K\bar{K}^*(892)+\text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{13}\Gamma_{17}/\Gamma$		
<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.305 ± 0.071	41 BIZOT	80 DM1	$e^+ e^-$
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41 Model dependent.

$\Gamma(\eta\rho) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{14}\Gamma_{17}/\Gamma$		
<u>VALUE (eV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

7 ± 3	ANTONELLI	88 DM2	$e^+ e^- \rightarrow \eta\pi^+\pi^-$
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$\Gamma(K\bar{K}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_{16}\Gamma_{17}/\Gamma$		
<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.035 ± 0.029	42 BIZOT	80 DM1	$e^+ e^-$
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42 Model dependent.

$\Gamma(\rho\pi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_3\Gamma_{17}/\Gamma$		
<u>VALUE (keV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

3.510 ± 0.090	43 BIZOT	80 DM1	$e^+ e^-$
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43 Model dependent.

$\rho(1700)$ BRANCHING RATIOS

$\Gamma(\rho\pi\pi)/\Gamma(4\pi)$	Γ_3/Γ_1		
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.28 ± 0.06	44 ABELE	01B CBAR	$0.0 \bar{p}n \rightarrow 5\pi$
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44 $\omega\pi$ not included.

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$	Γ_4/Γ_2			
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

~1.0	DEL COURT	81B DM1	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
0.7 ± 0.1	500 SCHACHT	74 STRC	5.5–18 $\gamma p \rightarrow p4\pi$
0.80	45 BINGHAM	72B HBC	9.3 $\gamma p \rightarrow p4\pi$

45 The $\pi\pi$ system is in S-wave.

$\Gamma(\rho^0\pi^0\pi^0)/\Gamma(\rho^\pm\pi^\mp\pi^0)$	Γ_5/Γ_6			
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.10	ATKINSON	85B OMEG	20–70 γp
<0.15	ATKINSON	82 OMEG 0	20–70 $\gamma p \rightarrow p4\pi$

NODE=M065225

NODE=M065225

NODE=M065G2

NODE=M065G2

NODE=M065G4;LINKAGE=B

NODE=M065G10

NODE=M065G10

NODE=M065G;LINKAGE=M

NODE=M065G11

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NODE=M065G5

NODE=M065G5

NODE=M065G5;LINKAGE=M

NODE=M065G12

NODE=M065G12

NODE=M065G12;LINKAGE=M

NODE=M065230

NODE=M065R19

NODE=M065R19

NODE=M065R;LINKAGE=BL

NODE=M065R1

NODE=M065R1

NODE=M065R1;LINKAGE=S

NODE=M065R6

NODE=M065R6

$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$	Γ_7/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.16±0.05	46 ABELE 01B CBAR 0.0 $\bar{p}n \rightarrow 5\pi$
46 $\omega\pi$ not included.	
$\Gamma(h_1(1170)\pi)/\Gamma(4\pi)$	Γ_8/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.17±0.06	47 ABELE 01B CBAR 0.0 $\bar{p}n \rightarrow 5\pi$
47 $\omega\pi$ not included.	
$\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$	Γ_9/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.30±0.10	48 ABELE 01B CBAR 0.0 $\bar{p}n \rightarrow 5\pi$
48 $\omega\pi$ not included.	
$\Gamma(\rho\rho)/\Gamma(4\pi)$	Γ_{10}/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.09±0.03	49 ABELE 01B CBAR 0.0 $\bar{p}n \rightarrow 5\pi$
49 $\omega\pi$ not included.	
$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{11}/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.287 ^{+0.043} _{-0.042}	BECKER 79 ASPK 17 $\pi^- p$ polarized
0.15 to 0.30	50 MARTIN 78C RVUE 17 $\pi^- p \rightarrow \pi^+ \pi^- n$
<0.20	51 COSTA... 77B RVUE $e^+ e^- \rightarrow 2\pi, 4\pi$
0.30 ± 0.05	50 FROGGATT 77 RVUE 17 $\pi^- p \rightarrow \pi^+ \pi^- n$
<0.15	52 EISENBERG 73 HBC 5 $\pi^+ p \rightarrow \Delta^{++} 2\pi$
0.25 ± 0.05	53 HYAMS 73 ASPK 17 $\pi^- p \rightarrow \pi^+ \pi^- n$
50 From phase shift analysis of HYAMS 73 data.	
51 Estimate using unitarity, time reversal invariance, Breit-Wigner.	
52 Estimated using one-pion-exchange model.	
53 Included in BECKER 79 analysis.	
$\Gamma(\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$	Γ_{11}/Γ_2
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.13±0.05	ASTON 80 OMEG 20–70 $\gamma p \rightarrow p 2\pi$
<0.14	54 DAVIER 73 STRC 6–18 $\gamma p \rightarrow p 4\pi$
<0.2	55 BINGHAM 72B HBC 9.3 $\gamma p \rightarrow p 2\pi$
54 Upper limit is estimate.	
55 2 σ upper limit.	
$\Gamma(\pi\pi)/\Gamma(4\pi)$	Γ_{12}/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.16±0.04	56,57 ABELE 01B CBAR 0.0 $\bar{p}n \rightarrow 5\pi$
56 Using ABELE 97.	
57 $\omega\pi$ not included.	
$\Gamma(K\bar{K}^*(892)+\text{c.c.})/\Gamma_{\text{total}}$	Γ_{13}/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
possibly seen	COAN 04 CLEO $\tau^- \rightarrow K^- \pi^- K^+ \nu_\tau$
$\Gamma(K\bar{K}^*(892)+\text{c.c.})/\Gamma(2(\pi^+\pi^-))$	Γ_{13}/Γ_2
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.15±0.03	58 DELCOURT 81B DM1 $e^+ e^- \rightarrow \bar{K}K\pi$
58 Assuming $\rho(1700)$ and ω radial excitations to be degenerate in mass.	

$\Gamma(\eta\rho)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{14}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •					
possibly seen		AKHMETSHIN 00D	CMD2	$e^+ e^- \rightarrow \eta\pi^+\pi^-$	
<0.04		DONNACHIE 87B	RVUE		
<0.02	58	ATKINSON 86B	OMEG	20–70 γp	

 $\Gamma(\eta\rho)/\Gamma(2(\pi^+\pi^-))$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{14}/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.123 ± 0.027	DELCOURT 82	DM1	$e^+ e^- \rightarrow \pi^+\pi^-$ MM	
~0.1	ASTON 80	OMEG	20–70 γp	

 $\Gamma(\pi^+\pi^- \text{ neutrals})/\Gamma(2(\pi^+\pi^-))$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$(\Gamma_5 + \Gamma_6 + 0.714\Gamma_{14})/\Gamma_2$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.6 ± 0.4	59 BALLAM 74	HBC	9.3 γp	

59 Upper limit. Background not subtracted.

 $\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{15}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AMELIN 00	VES	37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$	

 $\Gamma(K\bar{K})/\Gamma(2(\pi^+\pi^-))$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_{16}/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.015 ± 0.010	60 DELCOURT 81B	DM1	$e^+ e^- \rightarrow K\bar{K}$			
<0.04	95 BINGHAM 72B	HBC	0	9.3 γp		

60 Assuming $\rho(1700)$ and ω radial excitations to be degenerate in mass. $\Gamma(K\bar{K})/\Gamma(K\bar{K}^*(892)+\text{c.c.})$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{16}/Γ_{13}
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.052 ± 0.026	BUON 82	DM1	$e^+ e^- \rightarrow \text{hadrons}$	

 $\Gamma(\pi^0\omega)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{18}/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	1.6k	ACHASOV 12	SND	$e^+ e^- \rightarrow \pi^0\pi^0\gamma$	
not seen	2382	AKHMETSHIN 03B	CMD2	$e^+ e^- \rightarrow \pi^0\pi^0\gamma$	
seen		ACHASOV 97	RVUE	$e^+ e^- \rightarrow \omega\pi^0$	

 $\rho(1700)$ REFERENCES

ABRAMOWICZ 12	EPJ C72 1869	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
ACHASOV 12	JETPL 94 734	M.N. Achasov <i>et al.</i>	
	Translated from ZETFP 94 796.		
LEES 12G	PR D86 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)
FUJIKAWA 08	PR D78 072006	M. Fujikawa <i>et al.</i>	(BELLE Collab.)
COAN 04	PRL 92 232001	T.E. Coan <i>et al.</i>	(CLEO Collab.)
FRABETTI 04	PL B578 290	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
AKHMETSHIN 03B	PL B562 173	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
ABELE 01B	EPJ C21 261	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ACHASOV 00I	PL B486 29	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
AKHMETSHIN 00D	PL B489 125	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AMELIN 00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)
EDWARDS 00A	PR D61 072003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
ABELE 99D	PL B468 178	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ABELE 97	PL B391 191	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ACHASOV 97	PR D55 2663	N.N. Achasov <i>et al.</i>	(NOVM)
BERTIN 97C	PL B408 476	A. Bertin <i>et al.</i>	(OBELIX Collab.)
CLEGG 94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LNUC, MCHS)
CLEGG 90	ZPHY C45 677	A.B. Clegg, A. Donnachie	(LNUC, MCHS)
KUHN 90	ZPHY C48 445	J.H. Kuhn <i>et al.</i>	(MPIM)
BISELLO 89	PL B220 321	D. Bisello <i>et al.</i>	(DM2 Collab.)
DUBICKA 89	JPG 15 1349	S. Dubnicka <i>et al.</i>	(JINR, SLOV)
GESHKEN... 89	ZPHY C45 351	B.V. Geshkenbein	(ITEP)
ANTONELLI 88	PL B212 133	A. Antonelli <i>et al.</i>	(DM2 Collab.)
DIEMAN 88	PRPL 159 99	B. Diekmann	(BONN)
FUKUI 88	PL B202 441	S. Fukui <i>et al.</i>	(SUGI, NAGO, KEK, KYOT+)
DONNACHIE 87B	ZPHY C34 257	A. Donnachie, A.B. Clegg	(MCHS, LANC)
ATKINSON 86B	ZPHY C30 531	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
ATKINSON 85B	ZPHY C26 499	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
ERKAL 85	ZPHY C29 485	C. Erkal, M.G. Olson	(WISC)
ABE 84B	PRL 53 751	K. Abe <i>et al.</i>	(SLAC HFP Collab.)
KURDADZE 83	JETPL 37 733	L.M. Kurdadze <i>et al.</i>	(NOVO)
	Translated from ZETFP 37 613.		

NODE=M065

REFID=54274

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REFID=52536

REFID=49945

REFID=49614

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REFID=40583

REFID=40272

REFID=40273

REFID=40920

REFID=21508

REFID=21506

REFID=20136

REFID=21503

REFID=20133

ATKINSON	82	PL 108B 55	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=21493
BUON	82	PL 118B 221	J. Buon <i>et al.</i>	(LALO, MONP)	REFID=21494
CLELAND	82B	NP B208 228	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)	REFID=21281
CORDIER	82	PL 109B 129	A. Cordier <i>et al.</i>	(LALO)	REFID=21495
DEL COURT	82	PL 113B 93	B. Delcourt <i>et al.</i>	(LALO)	REFID=21496
ASTON	81E	NP B189 15	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)	REFID=21487
DEL COURT	81B	Bonn Conf. 205	B. Delcourt	(ORSAY)	REFID=21490
Also		PL 109B 129	A. Cordier <i>et al.</i>	(LALO)	REFID=21495
DIBIANCA	81	PR D23 595	F.A. di Bianca <i>et al.</i>	(CASE, CMU)	REFID=21492
ASTON	80	PL 92B 215	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)	REFID=21478
BACCI	80	PL 95B 139	C. Bacci <i>et al.</i>	(ROMA, FRAS)	REFID=21481
BIZOT	80	Madison Conf. 546	J.C. Bizot <i>et al.</i>	(LALO, MONP)	REFID=21482
KILLIAN	80	PR D21 3005	T.J. Killian <i>et al.</i>	(CORN)	REFID=21484
ATIYA	79B	PRL 43 1691	M.S. Atiya <i>et al.</i>	(COLU, ILL, FNAL)	REFID=21470
BECKER	79	NP B151 46	H. Becker <i>et al.</i>	(MPIM, CERN, ZEEM, CRAC)	REFID=21084
LANG	79	PR D19 956	C.B. Lang, A. Mas-Parareda	(GRAZ)	REFID=20126
MARTIN	78C	ANP 114 1	A.D. Martin, M.R. Pennington	(CERN)	REFID=21661
COSTA...	77B	PL 71B 345	B. Costa de Beauregard, B. Pire, T.N. Truong	(EPOL)	REFID=21465
FROGGATT	77	NP B129 89	C.D. Froggatt, J.L. Petersen	(GLAS, NORD)	REFID=21072
ALEXANDER	75	PL 57B 487	G. Alexander <i>et al.</i>	(TEL)	REFID=21450
BALLAM	74	NP B76 375	J. Ballam <i>et al.</i>	(SLAC, LBL, MPIM)	REFID=20610
CONVERSI	74	PL 52B 493	M. Conversi <i>et al.</i>	(ROMA, FRAS)	REFID=20637
SCHACHT	74	NP B81 205	P. Schacht <i>et al.</i>	(MPIM)	REFID=21449
DAVIER	73	NP B58 31	M. Davier <i>et al.</i>	(SLAC)	REFID=21434
EISENBERG	73	PL 43B 149	Y. Eisenberg <i>et al.</i>	(REHO)	REFID=21435
HYAMS	73	NP B64 134	B.D. Hyams <i>et al.</i>	(CERN, MPIM)	REFID=20107
BINGHAM	72B	PL 41B 635	H.H. Bingham <i>et al.</i>	(LBL, UCB, SLAC) IGJP	REFID=21426
JACOB	72	PR D5 1847	M. Jacob, R. Slansky		REFID=49668
GOURLARIS	68	PRL 21 244	G.J. Goumaris, J.J. Sakurai		REFID=48054

 $a_2(1700)$

$I^G(J^{PC}) = 1^-(2^{++})$

OMMITTED FROM SUMMARY TABLE

 $a_2(1700)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1732±16 OUR AVERAGE					Error includes scale factor of 1.9.
1737± 5± 7		ABE	04	BELL	10.6 $e^+e^- \rightarrow e^+e^- K^+K^-$
1698±44		¹ AMSLER	02	CBAR	0.9 $\bar{p}p \rightarrow \pi^0\eta\eta$
1660±40		ABELE	99B	CBAR	1.94 $\bar{p}p \rightarrow \pi^0\eta\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1675±25		ANISOVICH	09	RVUE	0.0 $\bar{p}p, \pi N$
1722± 9±15	18k	² SCHEGELSKY	06	RVUE 0	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
1702± 7	80k	³ UMAN	06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
1721±13±44	145k	LU	05	B852	18 $\pi^- p \rightarrow \omega\pi^-\pi^0 p$
1767±14	221	⁴ ACCIARRI	01H	L3	$\gamma\gamma \rightarrow K_S^0 K_S^0, E_{cm}^{ee} = 91, 183-209$ GeV

~ 1775

1752±21± 4

5	GRYGOREV	99	SPEC	40 $\pi^- p \rightarrow K_S^0 K_S^0 n$
	ACCIARRI	97T	L3	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$

1 T-matrix pole.

2 From analysis of L3 data at 183–209 GeV.

3 Statistical error only.

4 Spin 2 dominant, isospin not determined, could also be $I=1$.5 Possibly two $J^P = 2^+$ resonances with isospins 0 and 1.

NODE=M162

NODE=M162M

NODE=M162M

NODE=M162M;LINKAGE=TT

NODE=M162M;LINKAGE=SC

NODE=M162M;LINKAGE=ST

NODE=M162M;LINKAGE=HA

NODE=M162M;LINKAGE=GR

NODE=M162W

NODE=M162W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
194± 40 OUR AVERAGE					Error includes scale factor of 1.6. See the ideogram below.

151± 22±24		ABE	04	BELL	10.6 $e^+e^- \rightarrow e^+e^- K^+K^-$
265± 55		⁶ AMSLER	02	CBAR	0.9 $\bar{p}p \rightarrow \pi^0\eta\eta$
280± 70		ABELE	99B	CBAR	1.94 $\bar{p}p \rightarrow \pi^0\eta\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

270± 50		ANISOVICH	09	RVUE	0.0 $\bar{p}p, \pi N$
336± 20±20	18k	⁷ SCHEGELSKY	06	RVUE 0	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
417± 19	80k	⁸ UMAN	06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
279± 49±66	145k	LU	05	B852	18 $\pi^- p \rightarrow \omega\pi^-\pi^0 p$
187± 60	221	⁹ ACCIARRI	01H	L3	$\gamma\gamma \rightarrow K_S^0 K_S^0, E_{cm}^{ee} = 91, 183-209$ GeV

150±110±34		ACCIARRI	97T	L3	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
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NODE=M162W

NODE=M162W

6 T-matrix pole.

7 From analysis of L3 data at 183–209 GeV.

8 Statistical error only.

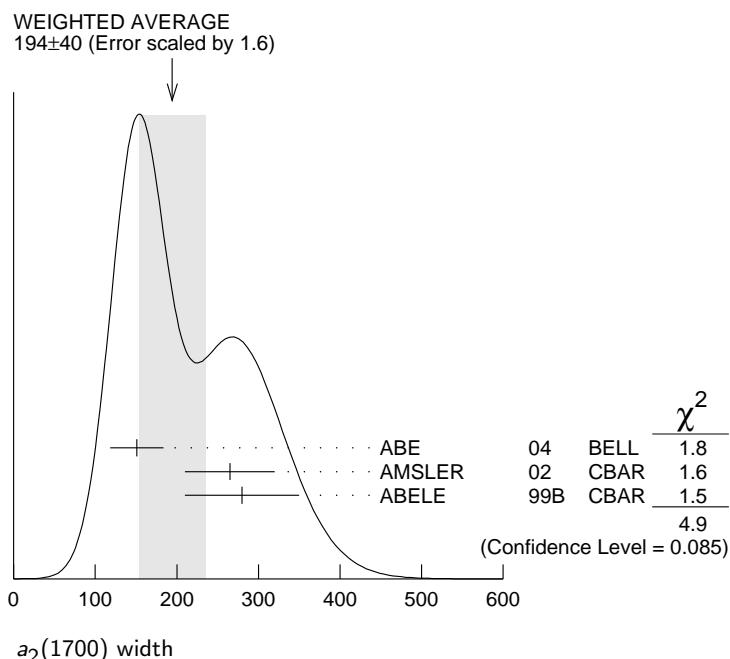
9 Spin 2 dominant, isospin not determined, could also be $I=1$.

NODE=M162W;LINKAGE=TT

NODE=M162W;LINKAGE=SC

NODE=M162W;LINKAGE=ST

NODE=M162W;LINKAGE=HA



$a_2(1700)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \eta\pi$	seen
$\Gamma_2 \gamma\gamma$	
$\Gamma_3 \rho\pi$	
$\Gamma_4 f_2(1270)\pi$	
$\Gamma_5 K\bar{K}$	seen
$\Gamma_6 \omega\pi^-\pi^0$	seen
$\Gamma_7 \omega\rho$	seen

$a_2(1700)$ PARTIAL WIDTHS

$\Gamma(\eta\pi)$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9.5±2.0	870	¹⁰ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

Γ_1

$\Gamma(\gamma\gamma)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.30±0.05	870	¹⁰ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

Γ_2

$\Gamma(K\bar{K})$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.0±3.0	870	¹⁰ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

Γ_5

• • • We do not use the following data for averages, fits, limits, etc. • • •

10 From analysis of L3 data at 91 and 183–209 GeV, using $a_2(1700)$ mass of 1730 MeV and width of 340 MeV, and SU(3) relations.

NODE=M162215;NODE=M162

DESIG=4;OUR EST;→ UNCHECKED ←

DESIG=1

DESIG=2

DESIG=3

DESIG=5;OUR EST;→ UNCHECKED ←

DESIG=6;OUR EVAL;→ UNCHECKED ←

DESIG=7;OUR EVAL;→ UNCHECKED ←

NODE=M162220

NODE=M162W3

NODE=M162W3

NODE=M162W2

NODE=M162W2

NODE=M162W1

NODE=M162W1

NODE=M162W1;LINKAGE=SC

$a_2(1700) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$[\Gamma(\rho\pi) + \Gamma(f_2(1270)\pi)] \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$(\Gamma_3 + \Gamma_4)\Gamma_2/\Gamma$		
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.29±0.04±0.02		ACCIARRI 97T	L3	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.37 ^{+0.12} _{-0.08} ±0.10	18k	11 SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_5\Gamma_2/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
20.6±4.2±4.6	12 ABE 04	BELL	$e^+ e^- \rightarrow e^+ e^- K^+ K^-$	
49 ± 11 ± 13	13 ACCIARRI 01H	L3	$\gamma\gamma \rightarrow K_S^0 K_S^0, E_{\text{cm}}^{\text{ee}} = 91, 183\text{--}209 \text{ GeV}$	

11 From analysis of L3 data at 183–209 GeV.

12 Assuming spin 2.

13 Spin 2 dominant, isospin not determined, could also be $I=1$. **$a_2(1700) \text{ BRANCHING RATIOS}$**

$\Gamma(\rho\pi)/\Gamma(f_2(1270)\pi)$		Γ_3/Γ_4		
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.4±0.4±0.1	18k	14 SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+ \pi^- \pi^0$

14 From analysis of L3 data at 183–209 GeV.

 $a_2(1700) \text{ REFERENCES}$

ANISOVICH 09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
SCHEGELSKY 06	EPJ A27 199	V.A. Schegelsky <i>et al.</i>	
SCHEGELSKY 06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>	
UMAN 06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)
LU 05	PRL 94 032002	M. Lu <i>et al.</i>	(BNL E852 Collab.)
ABE 04	EPJ C32 323	K. Abe <i>et al.</i>	(BELLE Collab.)
AMSLER 02	EPJ C23 29	C. Amsler <i>et al.</i>	
ACCIARRI 01H	PL B501 173	M. Acciarri <i>et al.</i>	(L3 Collab.)
ABELE 99B	EPJ C8 67	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
GRYGOREV 99	PAN 62 470	V.K. Grygorev <i>et al.</i>	
Translated from YAF 62 513.			
ACCIARRI 97T	PL B413 147	M. Acciarri <i>et al.</i>	(L3 Collab.)

NODE=M162225

NODE=M162G1

NODE=M162G1

NODE=M162G2

NODE=M162G2

NODE=M162G1;LINKAGE=SC

NODE=M162G2;LINKAGE=AB

NODE=M162G;LINKAGE=HA

NODE=M162235

NODE=M162R01

NODE=M162R01

NODE=M162R01;LINKAGE=SC

NODE=M162

REFID=52719

REFID=51186

REFID=51185

REFID=51063

REFID=50459

REFID=49650

REFID=48580

REFID=48321

REFID=46904

REFID=46909

REFID=45761

$f_0(1710)$ $I^G(J^{PC}) = 0^+(0^{++})$

NODE=M068

See our mini-review in the 2004 edition of this *Review*, Physics Letters **B592** 1 (2004). See also the mini-review on scalar mesons under $f_0(500)$ (see the index for the page number).

NODE=M068

 $f_0(1710)$ MASS

NODE=M068M

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1720± 6 OUR AVERAGE				Error includes scale factor of 1.6. See the ideogram below.
1701± 5 ^{+ 9} _{- 2}	4k	1 CHEKANOV 08	ZEUS $e p \rightarrow K_S^0 K_S^0 X$	
1765 ^{+ 4} _{- 3} ± 13		ABLIKIM 06V	BES2 $e^+ e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$	
1760±15 ⁺¹⁵ ₋₁₀		2 ABLIKIM 05Q	BES2 $\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$	
1738±30		ABLIKIM 04E	BES2 $J/\psi \rightarrow \omega K^+ K^-$	
1740± 4 ⁺¹⁰ ₋₂₅		3 BAI 03G	BES $J/\psi \rightarrow \gamma K \bar{K}$	
1740 ⁺³⁰ ₋₂₅		3 BAI 00A	BES $J/\psi \rightarrow \gamma(\pi^+ \pi^- \pi^+ \pi^-)$	
1698±18		4 BARBERIS 00E	$450 pp \rightarrow p_f \eta \eta p_s$	
1710±12 ±11		5 BARBERIS 99D	OMEG $450 pp \rightarrow K^+ K^-, \pi^+ \pi^-$	
1710±25		6 FRENCH 99	$300 pp \rightarrow p_f(K^+ K^-) p_s$	
1707±10		7 AUGUSTIN 88	DM2 $J/\psi \rightarrow \gamma K^+ K^-, K_S^0 K_S^0 X$	
1698±15		7 AUGUSTIN 87	DM2 $J/\psi \rightarrow \gamma \pi^+ \pi^-$	
1720±10 ±10		8 BALTRUSAIT..87	MRK3 $J/\psi \rightarrow \gamma K^+ K^-$	
1742±15		7 WILLIAMS 84	MPSF $200 \pi^- N \rightarrow 2K_S^0 X$	
1670±50		BLOOM 83	CBAL $J/\psi \rightarrow \gamma 2\eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1750±13		AMSLER 06	CBAR $1.64 \bar{p}p \rightarrow K^+ K^- \pi^0$	
1747± 5	80k	9,10 UMAN 06	E835 $5.2 \bar{p}p \rightarrow \eta \eta \pi^0$	
1776±15		VLADIMIRSK...06	SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$	
1790 ⁺⁴⁰ ₋₃₀		2 ABLIKIM 05	BES2 $J/\psi \rightarrow \phi \pi^+ \pi^-$	
1670±20		9 BINON 05	GAMS $33 \pi^- p \rightarrow \eta \eta \eta$	
1726± 7	74	10 CHEKANOV 04	ZEUS $e p \rightarrow K_S^0 K_S^0 X$	
1732±15		11 ANISOVICH 03	RVUE	
1682±16		TIKHOMIROV 03	SPEC $40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	
1670±26	3651	3,12 NICHITU 02	OBLX	
1770±12		13,14 ANISOVICH 99B	SPEC $0.6-1.2 p\bar{p} \rightarrow \eta \eta \pi^0$	
1730±15		3 BARBERIS 99	OMEG $450 pp \rightarrow p_s p_f K^+ K^-$	
1750±20		3 BARBERIS 99B	OMEG $450 pp \rightarrow p_s p_f \pi^+ \pi^-$	
1750±30		15 ANISOVICH 98B	RVUE Compilation	
1720±39		BAI 98H	BES $J/\psi \rightarrow \gamma \pi^0 \pi^0$	
1775± 1.5	57	16 BARKOV 98	$\pi^- p \rightarrow K_S^0 K_S^0 n$	
1690±11		17 ABREU 96C	DPLPH $Z^0 \rightarrow K^+ K^- + X$	
1696± 5 ^{+ 9} ₋₃₄		8 BAI 96C	BES $J/\psi \rightarrow \gamma K^+ K^-$	
1781± 8 ⁺¹⁰ ₋₃₁		3 BAI 96C	BES $J/\psi \rightarrow \gamma K^+ K^-$	OCCUR=2
1768±14		BALOSHIN 95	SPEC $40 \pi^- C \rightarrow K_S^0 K_S^0 X$	
1750±15		18 BUGG 95	MRK3 $J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$	
1620±16		8 BUGG 95	MRK3 $J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$	OCCUR=2
1748±10		7 ARMSTRONG 93C	E760 $\bar{p}p \rightarrow \pi^0 \eta \eta \rightarrow 6\gamma$	
~1750		BREAKSTONE 93	SFM $p p \rightarrow p p \pi^+ \pi^- \pi^+ \pi^-$	
1744±15		19 ALDE 92D	GAM2 $38 \pi^- p \rightarrow \eta \eta \eta$	
1713±10		20 ARMSTRONG 89D	OMEG $300 pp \rightarrow p p K^+ K^-$	
1706±10		20 ARMSTRONG 89D	OMEG $300 pp \rightarrow p p K_S^0 K_S^0$	OCCUR=2
1700±15		8 BOLONKIN 88	SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$	
1720±60		3 BOLONKIN 88	SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$	OCCUR=2
1638±10		21 FALVARO 88	DM2 $J/\psi \rightarrow \phi K^+ K^-, K_S^0 K_S^0$	

1690 ± 4	22	FALVARD	88	DM2	$J/\psi \rightarrow \phi K^+ K^-$, $K_S^0 K_S^0$	
1755 ± 8	23	ALDE	86C	GAM2	$38 \pi^- p \rightarrow n 2\eta$	
1730^{+2}_{-10}	24	LONGACRE	86	RVUE	$22 \pi^- p \rightarrow n 2K_S^0$	
1650 ± 50		BURKE	82	MRK2	$J/\psi \rightarrow \gamma 2\rho$	
1640 ± 50	25,26	EDWARDS	82D	CBAL	$J/\psi \rightarrow \gamma 2\eta$	
$1730 \pm 10 \pm 20$	27	ETKIN	82C	MPS	$23 \pi^- p \rightarrow n 2K_S^0$	

¹ In the SU(3) based model with a specific interference pattern of the $f_2(1270)$, $a_2^0(1320)$, and $f'_2(1525)$ mesons incoherently added to the $f_0(1710)$ and non-resonant background.

² This state may be different from $f_0(1710)$, see CLOSE 05.

³ $J^P = 0^+$.

⁴ T-matrix pole.

⁵ Supersedes BARBERIS 99 and BARBERIS 99B.

⁶ $J^P = 0^+$, superseded by ARMSTRONG 89D.

⁷ No JPC determination.

⁸ $J^P = 2^+$.

⁹ Breit-Wigner mass.

¹⁰ Systematic errors not estimated.

¹¹ K-matrix pole, assuming $J^P = 0^+$, from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K\bar{K}n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.

¹² Decaying to $f_0(1370)\pi\pi$.

¹³ $J^P = 0^+$.

¹⁴ Not seen by AMSLER 02.

¹⁵ T-matrix pole, assuming $J^P = 0^+$.

¹⁶ No JPC determination.

¹⁷ No JPC determination, width not determined.

¹⁸ From a fit to the 0^+ partial wave.

¹⁹ ALDE 92D combines all the GAMS-2000 data.

²⁰ $J^P = 2^+$, superseded by FRENCH 99.

²¹ From an analysis ignoring interference with $f'_2(1525)$.

²² From an analysis including interference with $f'_2(1525)$.

²³ Superseded by ALDE 92D.

²⁴ Uses MRK3 data. From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.

²⁵ $J^P = 2^+$ preferred.

²⁶ From fit neglecting nearby $f'_2(1525)$. Replaced by BLOOM 83.

²⁷ Superseded by LONGACRE 86.

OCCUR=2

NODE=M068M;LINKAGE=HE

NODE=M068M;LINKAGE=AB

NODE=M068M;LINKAGE=A8

NODE=M068M;LINKAGE=TP

NODE=M068M;LINKAGE=BD

NODE=M068M;LINKAGE=C3

NODE=M068M;LINKAGE=A1

NODE=M068M;LINKAGE=A3

NODE=M068M;LINKAGE=BW

NODE=M068M;LINKAGE=CH

NODE=M068M;LINKAGE=KM

NODE=M068M;LINKAGE=NC

NODE=M068M;LINKAGE=AV

NODE=M068M;LINKAGE=NS

NODE=M068M;LINKAGE=AN

NODE=M068M;LINKAGE=4A

NODE=M068M;LINKAGE=A4

NODE=M068M;LINKAGE=Q0

NODE=M068M;LINKAGE=AA

NODE=M068M;LINKAGE=C

NODE=M068M;LINKAGE=A

NODE=M068M;LINKAGE=B

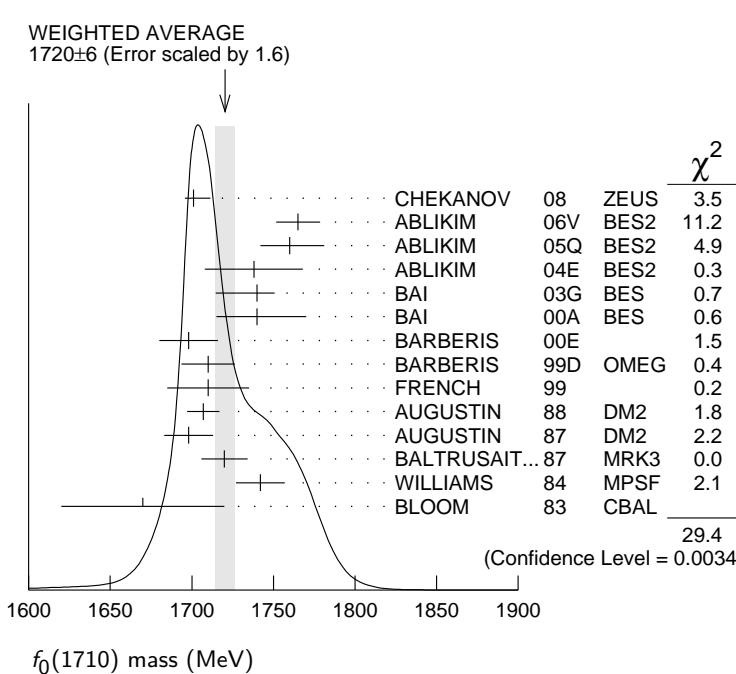
NODE=M068M;LINKAGE=BB

NODE=M068M;LINKAGE=A9

NODE=M068M;LINKAGE=B2

NODE=M068M;LINKAGE=E

NODE=M068M;LINKAGE=B1



NODE=M068W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
135 ± 8 OUR AVERAGE		Error includes scale factor of 1.1.			NODE=M068W
100 ± 24 +7 -22	4k	28 CHEKANOV 08	ZEUS	$e p \rightarrow K_S^0 K_S^0 X$	
145 ± 8 ±69		ABLIKIM 06v	BES2	$e^+ e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$	
125 ± 25 +10 -15		29 ABLIKIM 05Q	BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$	
125 ± 20		ABLIKIM 04E	BES2	$J/\psi \rightarrow \omega K^+ K^-$	
166 + 5 +15 - 8 -10	30 BAI	03G BES		$J/\psi \rightarrow \gamma K \bar{K}$	
120 + 50 - 40	30 BAI	00A BES		$J/\psi \rightarrow \gamma(\pi^+ \pi^- \pi^+ \pi^-)$	
120 ± 26	31 BARBERIS 00E			450 $p p \rightarrow p_f \eta \eta p_s$	
126 ± 16 ±18	32 BARBERIS 99D	OMEG		450 $p p \rightarrow K^+ K^-, \pi^+ \pi^-$	
105 ± 34	33 FRENCH 99			300 $p p \rightarrow p_f(K^+ K^-)p_s$	
166.4± 33.2	34 AUGUSTIN 88	DM2		$J/\psi \rightarrow \gamma K^+ K^-, K_S^0 K_S^0 X$	
136 ± 28	34 AUGUSTIN 87	DM2		$J/\psi \rightarrow \gamma \pi^+ \pi^-$	
130 ± 20	35 BALTRUSAIT..87	MRK3		$J/\psi \rightarrow \gamma K^+ K^-$	
57 ± 38	36 WILLIAMS 84	MPSF		200 $\pi^- N \rightarrow 2K_S^0 X$	
160 ± 80	BLOOM 83	CBAL		$J/\psi \rightarrow \gamma 2\eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
148 + 40 - 30	AMSLER 06	CBAR		1.64 $\bar{p} p \rightarrow K^+ K^- \pi^0$	
188 ± 13	80k 29,37 UMAN 06	E835		5.2 $\bar{p} p \rightarrow \eta \eta \pi^0$	
250 ± 30	VLADIMIRSK...06	SPEC		40 $\pi^- p \rightarrow K_S^0 K_S^0 n$	
270 + 60 - 30	38 ABLIKIM 05	BES2		$J/\psi \rightarrow \phi \pi^+ \pi^-$	
260 ± 50	29 BINON 05	GAMS		33 $\pi^- p \rightarrow \eta \eta \eta$	
38 + 20 - 14	74 37 CHEKANOV 04	ZEUS		$e p \rightarrow K_S^0 K_S^0 X$	
144 ± 30	39,40 ANISOVICH 03	RVUE			OCCUR=2
320 + 50 - 20	40,41 ANISOVICH 03	RVUE			
102 ± 26	TIKHOLOMOV 03	SPEC		40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	
267 ± 44	3651 30,42 NICHITU 02	OBLX			
220 ± 40	43,44 ANISOVICH 99B	SPEC		0.6–1.2 $p \bar{p} \rightarrow \eta \eta \pi^0$	
100 ± 25	30 BARBERIS 99	OMEG		450 $p p \rightarrow p_s p_f K^+ K^-$	
160 ± 30	30 BARBERIS 99B	OMEG		450 $p p \rightarrow p_s p_f \pi^+ \pi^-$	
250 ± 140	45 ANISOVICH 98B	RVUE		Compilation	
30 ± 7	57 46 BARKOV 98			$\pi^- p \rightarrow K_S^0 K_S^0 n$	
103 ± 18 +30 - 11	35 BAI 96C	BES		$J/\psi \rightarrow \gamma K^+ K^-$	
85 ± 24 +22 - 19	30 BAI 96C	BES		$J/\psi \rightarrow \gamma K^+ K^-$	OCCUR=2
56 ± 19	BALOSHIN 95	SPEC		40 $\pi^- C \rightarrow K_S^0 K_S^0 X$	
160 ± 40	47 BUGG 95	MRK3		$J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$	
160 + 60 - 20	35 BUGG 95	MRK3		$J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$	OCCUR=2
264 ± 25	34 ARMSTRONG 93C	E760		$\bar{p} p \rightarrow \pi^0 \eta \eta \rightarrow 6\gamma$	
200 to 300	BREAKSTONE 93	SFM		$p p \rightarrow p p \pi^+ \pi^- \pi^+ \pi^-$	
< 80 90% CL	48 ALDE 92D	GAM2		38 $\pi^- p \rightarrow \eta \eta N^*$	
181 ± 30	49 ARMSTRONG 89D	OMEG		300 $p p \rightarrow p p K^+ K^-$	
104 ± 30	49 ARMSTRONG 89D	OMEG		300 $p p \rightarrow p p K_S^0 K_S^0$	OCCUR=2
30 ± 20	35 BOLONKIN 88	SPEC		40 $\pi^- p \rightarrow K_S^0 K_S^0 n$	
350 ± 150	30 BOLONKIN 88	SPEC		40 $\pi^- p \rightarrow K_S^0 K_S^0 n$	OCCUR=2
148 ± 17	50 FALVARD 88	DM2		$J/\psi \rightarrow \phi K^+ K^-, K_S^0 K_S^0$	
184 ± 6	51 FALVARD 88	DM2		$J/\psi \rightarrow \phi K^+ K^-, K_S^0 K_S^0$	OCCUR=2
122 + 74 - 15	52 LONGACRE 86	RVUE		22 $\pi^- p \rightarrow n 2K_S^0$	
200 ± 100	BURKE 82	MRK2		$J/\psi \rightarrow \gamma 2\rho$	
220 + 100 - 70	53,54 EDWARDS 82D	CBAL		$J/\psi \rightarrow \gamma 2\eta$	
200 + 156 - 9	55 ETKIN 82B	MPS		23 $\pi^- p \rightarrow n 2K_S^0$	

28 In the SU(3) based model with a specific interference pattern of the $f_2(1270)$, $a_2^0(1320)$, and $f_2'(1525)$ mesons incoherently added to the $f_0(1710)$ and non-resonant background.

NODE=M068W;LINKAGE=HE

29 Breit-Wigner width.

NODE=M068W;LINKAGE=BW

30 $J^P = 0^+$.

NODE=M068W;LINKAGE=A8

31 T-matrix pole.

NODE=M068W;LINKAGE=TP

- 32 Supersedes BARBERIS 99 and BARBERIS 99B.
 33 $J^P = 0^+$, supersedes by ARMSTRONG 89D.
 34 No $J^P C$ determination.
 35 $J^P = 2^+$.
 36 No $J^P C$ determination.
 37 Systematic errors not estimated.
 38 This state may be different from $f_0(1710)$, see CLOSE 05.
 39 (Solution I)
 40 K-matrix pole, assuming $J^P = 0^+$, from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K\bar{K}n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p}p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p}n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.
 41 (Solution I)
 42 Decaying to $f_0(1370) \pi \pi$.
 43 $J^P = 0^+$.
 44 Not seen by AMSLER 02.
 45 T-matrix pole, assuming $J^P = 0^+$
 46 No $J^P C$ determination.
 47 From a fit to the 0^+ partial wave.
 48 ALDE 92D combines all the GAMS-2000 data.
 49 $J^P = 2^+$, (0^+ excluded).
 50 From an analysis ignoring interference with $f'_2(1525)$.
 51 From an analysis including interference with $f'_2(1525)$.
 52 Uses MRK3 data. From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2. Fit with constrained inelasticity.
 53 $J^P = 2^+$ preferred.
 54 From fit neglecting nearby $f'_2(1525)$. Replaced by BLOOM 83.
 55 From an amplitude analysis of the $K_S^0 K_S^0$ system, superseded by LONGACRE 86.

$f_0(1710)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\bar{K}$	seen
$\Gamma_2 \eta\eta$	seen
$\Gamma_3 \pi\pi$	seen
$\Gamma_4 \gamma\gamma$	
$\Gamma_5 \omega\omega$	seen

$f_0(1710) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_1 \Gamma_4/\Gamma$
<u>VALUE (eV)</u>	<u>CL%</u>
<110	95
	56 BEHREND
	89C CELL
	$\gamma\gamma \rightarrow K_S^0 K_S^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<480	95
<280	95
	56 ALBRECHT
	85B TASS
	$\gamma\gamma \rightarrow K^+ K^-$
	$\gamma\gamma \rightarrow K\bar{K}\pi$

56 Assuming helicity 2.

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_3 \Gamma_4/\Gamma$
<u>VALUE (keV)</u>	<u>CL%</u>
<0.82	95
	57 BARATE
	00E ALEP
	$\gamma\gamma \rightarrow \pi^+ \pi^-$

57 Assuming spin 0.

$f_0(1710)$ BRANCHING RATIOS

$\Gamma(K\bar{K})/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>
0.36 ± 0.12	ALBALADEJO 08 RVUE
0.38 ^{+0.09} _{-0.19}	58,59 LONGACRE 86 MPS $22 \pi^- p \rightarrow n2K_S^0$

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 NODE=M068W;LINKAGE=A1
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 NODE=M068W;LINKAGE=A

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 DESIG=1;OUR EST;→ UNCHECKED ←
 DESIG=5;OUR EST;→ UNCHECKED ←
 DESIG=6
 DESIG=4

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NODE=M068G3
 NODE=M068G3

NODE=M068G;LINKAGE=Z

NODE=M068225

NODE=M068R2
 NODE=M068R2

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.22 \pm 0.12	ALBALADEJO 08	RVUE	
0.18 $^{+0.03}_{-0.13}$	58,59 LONGACRE	86	RVUE

 Γ_2/Γ

NODE=M068R1
NODE=M068R1

 $\Gamma(\pi\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
not seen	AMSLER	02	CBAR $0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$
0.039 $^{+0.002}_{-0.024}$	58,59 LONGACRE	86	RVUE

 Γ_3/Γ

NODE=M068R5
NODE=M068R5

 $\Gamma(\pi\pi)/\Gamma(K\bar{K})$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.41 $^{+0.11}_{-0.17}$		ABLIKIM	06V	BES2 $e^+ e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.32 \pm 0.14		ALBALADEJO 08	RVUE	
< 0.11	95	60 ABLIKIM	04E	BES2 $J/\psi \rightarrow \omega K^+ K^-$
5.8 $^{+9.1}_{-5.5}$		61 ANISOVICH	02D	SPEC Combined fit
0.2 \pm 0.024 \pm 0.036		BARBERIS	99D	OMEG $450 \bar{p}p \rightarrow K^+ K^-, \pi^+ \pi^-$
0.39 \pm 0.14		ARMSTRONG	91	OMEG $300 \bar{p}p \rightarrow pp\pi\pi, ppK\bar{K}$

 Γ_3/Γ_1

NODE=M068R6
NODE=M068R6

 $\Gamma(\eta\eta)/\Gamma(K\bar{K})$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.48 \pm 0.15		BARBERIS	00E	$450 \bar{p}p \rightarrow p_f \eta\eta p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.46 $^{+0.70}_{-0.38}$		61 ANISOVICH	02D	SPEC Combined fit
< 0.02	90	62 PROKOSHKIN 91	GA24	$300 \pi^- p \rightarrow \pi^- p\eta\eta$

 Γ_2/Γ_1

NODE=M068R7
NODE=M068R7

 $\Gamma(\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
seen	180	ABLIKIM	06H BES	$J/\psi \rightarrow \gamma\omega\omega$

 Γ_5/Γ

NODE=M068R3
NODE=M068R3

- 58 From a partial-wave analysis of data using a K-matrix formalism with 5 poles, but assuming spin 2.
 59 Fit with constrained inelasticity.
 60 Using data from ABLIKIM 04A.
 61 From a combined K-matrix analysis of Crystal Barrel (0. $p\bar{p} \rightarrow \pi^0 \pi^0 \pi^0, \pi^0 \eta\eta, \pi^0 \pi^0 \eta$), GAMS ($\pi p \rightarrow \pi^0 \pi^0 n, \eta\eta n, \eta\eta' n$), and BNL ($\pi p \rightarrow K\bar{K} n$) data.
 62 Combining results of GAM4 with those of ARMSTRONG 89D.

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NODE=M068R;LINKAGE=M

NODE=M068R;LINKAGE=AB

NODE=M068R;LINKAGE=CH

NODE=M068R;LINKAGE=A

NODE=M068

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REFID=49653
REFID=49401
REFID=49580
REFID=49423

REFID=48580
REFID=48831

f₀(1710) REFERENCES

ALBALADEJO 08	PRL 101 252002	M. Albaladejo, J.A. Oller	
CHEKANOV 08	PRL 101 112003	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
ABLIKIM 06H	PR D73 112007	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM 06V	PL B642 441	M. Ablikim <i>et al.</i>	(BES Collab.)
AMSLER 06	PL B639 165	C. Amsler <i>et al.</i>	(CBAR Collab.)
UMAN 06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)
VЛАДИМИРСК... 06	PAN 69 493	V.V. Vladimirska <i>et al.</i>	(ITEP, Moscow)
		Translated from YAF 69 515.	
ABLIKIM 05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM 05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
BINON 05	PAN 68 960	F. Binon <i>et al.</i>	
		Translated from YAF 68 998.	
CLOSE 05	PR D71 094022	F.E. Close, Q. Zhao	
ABLIKIM 04A	PL B598 149	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM 04E	PL B603 138	M. Ablikim <i>et al.</i>	(BES Collab.)
CHEKANOV 04	PL B578 33	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
PDG 04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)
ANISOVICH 03	EPJ A16 229	V.V. Anisovich <i>et al.</i>	
BAI 03G	PR D68 052003	J.Z. Bai <i>et al.</i>	(BES Collab.)
TIKHOMIROV 03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>	
		Translated from YAF 66 860.	
AMSLER 02	EPJ C23 29	C. Amsler <i>et al.</i>	
ANISOVICH 02D	PAN 65 1545	V.V. Anisovich <i>et al.</i>	
		Translated from YAF 65 1583.	

NICHITIU	02	PL B545 261	F. Nichitiu <i>et al.</i>	(OBELIX Collab.)	REFID=48848
BAI	00A	PL B472 207	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47426
BARATE	00E	PL B472 189	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=47428
BARBERIS	00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)	REFID=47961
ANISOVICH	99B	PL B449 154	A.V. Anisovich <i>et al.</i>		REFID=46886
BARBERIS	99	PL B453 305	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46921
BARBERIS	99B	PL B453 316	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46922
BARBERIS	99D	PL B462 462	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=47395
FRENCH	99	PL B460 213	B. French <i>et al.</i>	(WA76 Collab.)	REFID=47491
ANISOVICH	99B	SPU 41 419	V.V. Anisovich <i>et al.</i>		REFID=46331
		Translated from UFN 168 481.			
BAI	98H	PRL 81 1179	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46342
BARKOV	98	JETPL 68 764	B.P. Barkov <i>et al.</i>		REFID=46616
ABREU	96C	PL B379 309	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=44671
BAI	96C	PRL 77 3959	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=45169
BALOSHIN	95	PAN 58 46	O.N. Baloshin <i>et al.</i>	(ITEP)	REFID=44621
		Translated from YAF 58 50.			
BUGG	95	PL B353 378	D.V. Bugg <i>et al.</i>	(LOQM, PNPI, WASH)	REFID=44438
ARMSTRONG	93C	PL B307 394	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	REFID=43587
BREAKSTONE	93	ZPHY C58 251	A.M. Breakstone <i>et al.</i>	(IOWA, CERN, DORT+)	REFID=43312
ALDE	92D	PL B284 457	D.M. Alde <i>et al.</i>	(GAM2 Collab.)	REFID=41591
Also		SJNP 54 451	D.M. Alde <i>et al.</i>	(GAM2 Collab.)	REFID=44696
		Translated from YAF 54 745.			
ARMSTRONG	91	ZPHY C51 351	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)	REFID=41744
PROKOSHKIN	91	SPD 36 155	Y.D. Prokoshkin	(GAM2, GAM4 Collab.)	REFID=41719
		Translated from DANS 316 900.			
ALBRECHT	90G	ZPHY C48 183	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=41374
ARMSTRONG	89D	PL B227 186	T.A. Armstrong, M. Benayoun	(ATHU, BARI, BIRM+)	REFID=41010
BEHREND	89C	ZPHY C43 91	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=40915
AUGUSTIN	88	PRL 60 2238	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=40574
BOLONKIN	88	NP B309 426	B.V. Bolonkin <i>et al.</i>	(ITEP, SERP)	REFID=40580
FALVARD	88	PR D38 2706	A. Falvard <i>et al.</i>	(CLER, FRAS, LAZO+)	REFID=40576
AUGUSTIN	87	ZPHY C36 369	J.E. Augustin <i>et al.</i>	(LAZO, CLER, FRAS+)	REFID=40268
BALTRUSAITIS	87	PR D35 2077	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=40010
ALDE	86C	PL B182 105	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP)	REFID=21694
LONGACRE	86	PL B177 223	R.S. Longacre <i>et al.</i>	(BNL, BRAN, CUNY+)	REFID=20768
ALTHOFF	85B	ZPHY C29 189	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=21349
WILLIAMS	84	PR D30 877	E.G.H. Williams <i>et al.</i>	(VAND, NDAM, TUFTS+)	REFID=21693
BLOOM	83	ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)	REFID=21682
BURKE	82	PRL 49 632	D.L. Burke <i>et al.</i>	(LBL, SLAC)	REFID=21676
EDWARDS	82D	PRL 48 458	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21677
ETKIN	82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)	REFID=20390
ETKIN	82C	PR D25 2446	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)	REFID=20391

 $\eta(1760)$ $I^G(J^{PC}) = 0^+(0^-+)$

OMMITTED FROM SUMMARY TABLE

Seen by DM2 in the $\rho\rho$ system (BISELLO 89B). Structure in this region has been reported before in the same system (BALTRUSAITIS 86B) and in the $\omega\omega$ system (BALTRUSAITIS 85C, BISELLO 87).

 $\eta(1760)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1756 ± 9 OUR AVERAGE					
1744 ± 10 ± 15	1045	¹ ABLIKIM	06H BES	$J/\psi \rightarrow \gamma\omega\omega$	
1760 ± 11	320	² BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$	

¹ From a partial wave analysis including $\eta(1760)$, $f_0(1710)$, $f_2(1640)$, and $f_2(1910)$.² Estimated by us from various fits.

NODE=M114

NODE=M114

NODE=M114M

NODE=M114M

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NODE=M114M;LINKAGE=A

NODE=M114W

NODE=M114W

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NODE=M114

REFID=51125
REFID=40575
REFID=40012
REFID=22100
REFID=22095 $\eta(1760)$ REFERENCES

ABLIKIM	06H	PR D73 112007	M. Ablikim <i>et al.</i>	(BES Collab.)
BISELLO	89B	PR D39 701	G. Busetto <i>et al.</i>	(DM2 Collab.)
BISELLO	87	PL B192 239	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)
BALTRUSAITIS	86B	PR D33 1222	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
BALTRUSAITIS	85C	PRL 55 1723	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+)

NODE=M075

 $\pi(1800)$

$$I^G(J^{PC}) = 1^-(0^{-+})$$

See also minireview under non- $q\bar{q}$ candidates in PDG 06, Journal of Physics, G **33** 1 (2006).

 $\pi(1800)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1812±12 OUR AVERAGE		Error includes scale factor of 2.3. See the ideogram below.			
1785± 9±12	420k	ALEKSEEV	10	COMP	190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
1876±18±16	4k	EUGENIO	08	B852	18 $\pi^- p \rightarrow \eta \eta \pi^- p$
1774±18±20		CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$
1863± 9±10		CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$
1840±10±10	1200	AMELIN	96B	VES	37 $\pi^- A \rightarrow \eta \eta \pi^- A$
1775± 7±10		AMELIN	95B	VES	36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$
1790±14		BERDNIKOV	94	VES	37 $\pi^- A \rightarrow K^+ K^- \pi^- A$
1873±33±20		BELADIDZE	92C	VES	36 $\pi^- Be \rightarrow \pi^- \eta' \eta Be$
1814±10±23	426 ± 57	BITYUKOV	91	VES	36 $\pi^- C \rightarrow \pi^- \eta \eta C$
1770±30	1100	BELLINI	82	SPEC	40 $\pi^- A \rightarrow 3\pi A$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1737± 5±15		AMELIN	99	VES	37 $\pi^- A \rightarrow \omega \pi^- \pi^0 A^*$

1 From a single-pole fit.

2 In the $f_0(980)\pi$ wave.3 In the $f_0(500)\pi$ wave.4 From a fit to $J^{PC} = 0^{-+}$ $f_0(980)\pi$, $f_0(1370)\pi$ waves.5 From a fit to $J^{PC} = 0^{-+}$ $K_0^*(1430)K^-$ and $f_0(980)\pi^-$ waves.

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NODE=M075M

OCCUR=2

NODE=M075M;LINKAGE=SP

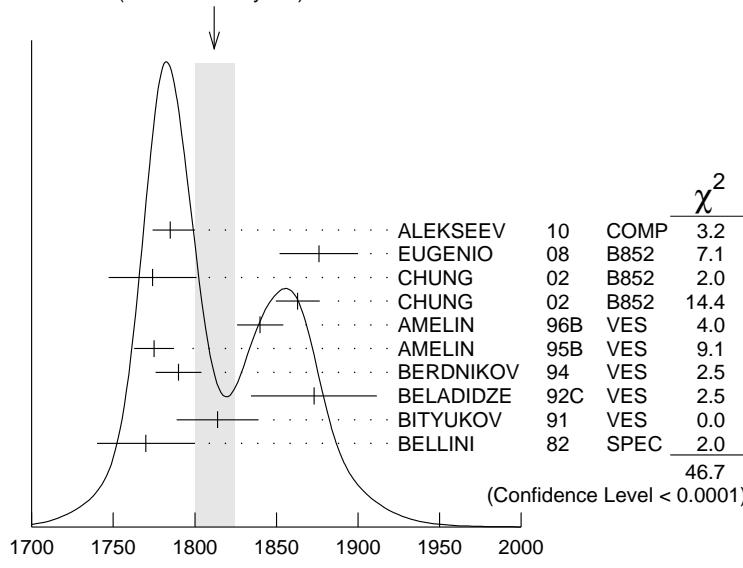
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NODE=M075M;LINKAGE=C2

NODE=M075M;LINKAGE=AX

NODE=M075M;LINKAGE=A

WEIGHTED AVERAGE
1812±12 (Error scaled by 2.3)

 $\pi(1800)$ mass (MeV) **$\pi(1800)$ WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
208±12 OUR AVERAGE		Error includes scale factor of 2.3. See the ideogram below.			
208±22±21	420k	ALEKSEEV	10	COMP	190 $\pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
221±26±38	4k	EUGENIO	08	B852	18 $\pi^- p \rightarrow \eta \eta \pi^- p$
223±48±50		CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

NODE=M075W

NODE=M075W

191±21±20		⁸ CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$	OCCUR=2
210±30±30	1200	AMELIN	96B	VES	— 37 $\pi^- A \rightarrow \eta \eta \pi^- A$	
190±15±15		⁹ AMELIN	95B	VES	— 36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$	
210±70		¹⁰ BERDNIKOV	94	VES	— 37 $\pi^- A \rightarrow K^+ K^- \pi^- A$	
225±35±20		BELADIDZE	92C	VES	— 36 $\pi^- Be \rightarrow \pi^- \eta' \eta Be$	
205±18±32	426 ± 57	BITYUKOV	91	VES	— 36 $\pi^- C \rightarrow \pi^- \eta \eta C$	
310±50	1100	BELLINI	82	SPEC	— 40 $\pi^- A \rightarrow 3\pi A$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
259±19± 6		AMELIN	99	VES	37 $\pi^- A \rightarrow \omega \pi^- \pi^0 A^*$	

⁶ From a single-pole fit.
⁷ In the $f_0(980)\pi^-$ wave.
⁸ In the $f_0(500)\pi^-$ wave.
⁹ From a fit to $J^{PC} = 0^- + f_0(980)\pi^-$, $f_0(1370)\pi^-$ waves.
¹⁰ From a fit to $J^{PC} = 0^- + K_0^*(1430)K^-$ and $f_0(980)\pi^-$ waves.

$\pi(1800)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi^+ \pi^- \pi^-$	seen
$\Gamma_2 f_0(500)\pi^-$	seen
$\Gamma_3 f_0(980)\pi^-$	seen
$\Gamma_4 f_0(1370)\pi^-$	seen
$\Gamma_5 f_0(1500)\pi^-$	not seen
$\Gamma_6 \rho \pi^-$	not seen
$\Gamma_7 \eta \eta \pi^-$	seen
$\Gamma_8 a_0(980)\eta$	seen
$\Gamma_9 a_2(1320)\eta$	not seen
$\Gamma_{10} f_2(1270)\pi^-$	not seen
$\Gamma_{11} f_0(1370)\pi^-$	not seen
$\Gamma_{12} f_0(1500)\pi^-$	seen
$\Gamma_{13} \eta \eta'(958)\pi^-$	seen
$\Gamma_{14} K_0^*(1430)K^-$	seen
$\Gamma_{15} K^*(892)K^-$	not seen

$\pi(1800)$ BRANCHING RATIOS

$\Gamma(f_0(980)\pi^-)/\Gamma(f_0(500)\pi^-)$	Γ_3/Γ_2		
VALUE	DOCUMENT ID	TECN	COMMENT
0.44±0.08±0.38	11 CHUNG	02	B852 18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

$\Gamma(f_0(980)\pi^-)/\Gamma(f_0(1370)\pi^-)$	Γ_3/Γ_4			
VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.7±1.3	12 AMELIN	95B	VES	— 36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$

$\Gamma(f_0(1370)\pi^-)/\Gamma_{\text{total}}$	Γ_4/Γ			
VALUE	DOCUMENT ID	TECN	CHG	COMMENT
seen	BELLINI	82	SPEC	— 40 $\pi^- A \rightarrow 3\pi A$

$\Gamma(f_0(1500)\pi^-)/\Gamma_{\text{total}}$	Γ_5/Γ		
VALUE	DOCUMENT ID	TECN	COMMENT
not seen	CHUNG	02	B852 18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

$\Gamma(\rho \pi^-)/\Gamma_{\text{total}}$	Γ_6/Γ			
VALUE	DOCUMENT ID	TECN	CHG	COMMENT
not seen	BELLINI	82	SPEC	— 40 $\pi^- A \rightarrow 3\pi A$

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 NODE=M075W;LINKAGE=C1
 NODE=M075W;LINKAGE=C2
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$\Gamma(\rho\pi^-)/\Gamma(f_0(980)\pi^-)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_6/Γ_3
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
<0.25		CHUNG 02	B852		$18.3 \pi^- p \rightarrow \pi^+ \pi^- \pi^- p$	
<0.14	90	AMELIN 95B	VES	-	$36 \pi^- A \rightarrow \pi^+ \pi^- \pi^- A$	

 $\Gamma(\eta\eta\pi^-)/\Gamma(\pi^+\pi^-\pi^-)$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_7/Γ_1
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
0.5 ± 0.1	1200	$^{12} \text{AMELIN}$	96B	VES	-	$37 \pi^- A \rightarrow \eta\eta\pi^- A$

 $\Gamma(a_2(1320)\eta)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_9/Γ
not seen	EUGENIO 08	B852	$18 \pi^- p \rightarrow \eta\eta\pi^- p$	

 $\Gamma(f_2(1270)\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{10}/Γ
not seen	EUGENIO 08	B852	$18 \pi^- p \rightarrow \eta\eta\pi^- p$	

 $\Gamma(f_0(1370)\pi^-)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{11}/Γ
not seen	EUGENIO 08	B852	$18 \pi^- p \rightarrow \eta\eta\pi^- p$	

 $\Gamma(f_0(1500)\pi^-)/\Gamma(a_0(980)\eta)$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_{12}/Γ_8
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						

0.48 ± 0.17	$4k$	$^{12,13} \text{EUGENIO}$	08	B852	-	$18 \pi^- p \rightarrow \eta\eta\pi^- p$
$0.030^{+0.014}_{-0.011}$		$^{12} \text{ANISOVICH}$	01B	SPEC	0	$0.6-1.94 p\bar{p} \rightarrow \eta\eta\pi^0\pi^0$
0.08 ± 0.03	1200	$^{12,14} \text{AMELIN}$	96B	VES	-	$37 \pi^- A \rightarrow \eta\eta\pi^- A$

 $\Gamma(\eta\eta'(958)\pi^-)/\Gamma(\eta\eta\pi^-)$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_{13}/Γ_7
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						

0.29 ± 0.07		$^{12} \text{BELADIDZE}$	92C	VES	-	$36 \pi^- \text{Be} \rightarrow \pi^- \eta' \eta \text{Be}$
0.3 ± 0.1	426 ± 57	$^{12} \text{BITYUKOV}$	91	VES	-	$36 \pi^- \text{C} \rightarrow \pi^- \eta \eta \text{C}$

 $\Gamma(K_0^*(1430)K^-)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_{14}/Γ
seen	BERDNIKOV 94	VES	-	$37 \pi^- A \rightarrow K^+ K^- \pi^- A$	

 $\Gamma(K^*(892)K^-)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_{15}/Γ
not seen	BERDNIKOV 94	VES	-	$37 \pi^- A \rightarrow K^+ K^- \pi^- A$	

11 Assuming that $f_0(980)$ decays only to $\pi\pi$.

12 Systematic errors not estimated.

13 From a single-pole fit.

14 Assuming that $f_0(1500)$ decays only to $\eta\eta$ and $a_0(980)$ decays only to $\eta\pi$.

 $\pi(1800)$ REFERENCES

ALEKSEEV 10	PRL 104 241803	M.G. Alekseev <i>et al.</i>	(COMPASS Collab.)
EUGENIO 08	PL B660 466	P. Eugenio <i>et al.</i>	(BNL E852 Collab.)
PDG 06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
CHUNG 02	PR D65 072001	S.U. Chung <i>et al.</i>	(BNL E852 Collab.)
ANISOVICH 01B	PL B500 222	A.V. Anisovich <i>et al.</i>	
AMELIN 99	PAN 62 445	D.V. Amelin <i>et al.</i>	(VES Collab.)
AMELIN 96B	PAN 59 976	D.V. Amelin <i>et al.</i>	(SERP, TBIL) IGJPC
AMELIN 95B	PL B356 595	D.V. Amelin <i>et al.</i>	(SERP, TBIL)
BERDNIKOV 94	PL B337 219	E.B. Berdnikov <i>et al.</i>	(SERP, TBIL)
BELADIDZE 92C	SJNP 55 1535	G.M. Beladidze, S.I. Bityukov, G.V. Borisov	(SERP+)
BITYUKOV 91	PL B268 137	S.I. Bityukov <i>et al.</i>	(SERP, TBIL)
BELLINI 82	PRL 48 1697	G. Bellini <i>et al.</i>	(MILA, BGNA, JINR)

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$f_2(1810)$ $I^G(J^{PC}) = 0^+(2^{++})$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

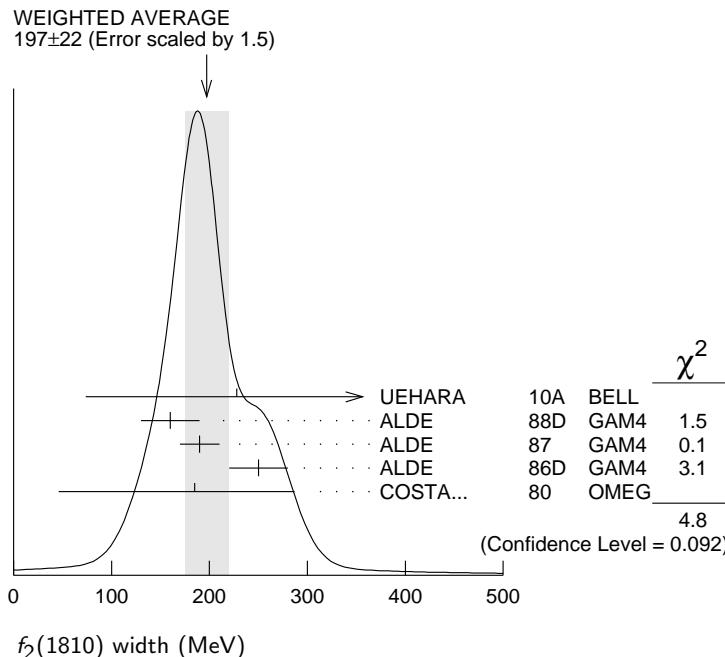
$f_2(1810)$ MASS					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1815±12 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
1737± 9 ⁺¹⁹⁸ ₋₆₅	1	UEHARA	10A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \eta\eta$	NODE=M038M
1800±30	40	ALDE	88D GAM4	$300 \pi^- p \rightarrow \pi^- p 4\pi^0$	NODE=M038M
1806±10	1600	ALDE	87 GAM4	$100 \pi^- p \rightarrow 4\pi^0 n$	NODE=M038M
1870±40	2	ALDE	86D GAM4	$100 \pi^- p \rightarrow \eta\eta n$	
1857 ⁺³⁵ ₋₂₄	3	COSTA...	80 OMEG	$10 \pi^- p \rightarrow K^+ K^- n$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1858 ⁺¹⁸ ₋₇₁	4	LONGACRE	86 RVUE	Compilation	NODE=M038M;LINKAGE=UE
1799±15	5	CASON	82 STRC	$8 \pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$	NODE=M038M;LINKAGE=F
1 Breit-Wigner mass.					NODE=M038M;LINKAGE=A
2 Seen in only one solution.					NODE=M038M;LINKAGE=L
3 Error increased by spread of two solutions. Included in LONGACRE 86 global analysis.					NODE=M038M;LINKAGE=P1
4 From a partial-wave analysis of data using a K-matrix formalism with 5 poles. Includes compilation of several other experiments.					
5 From an amplitude analysis of the reaction $\pi^+ \pi^- \rightarrow 2\pi^0$. The resonance in the $2\pi^0$ final state is not confirmed by PROKOSHIN 97.					
WEIGHTED AVERAGE 1815±12 (Error scaled by 1.4)					
(Confidence Level = 0.111)					
$f_2(1810)$ mass (MeV)					

 $f_2(1810)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
197± 22 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.				
228 ^{+ 21 +234} _{- 20 -153}	6	UEHARA	10A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \eta\eta$	NODE=M038W
160± 30	40	ALDE	88D GAM4	$300 \pi^- p \rightarrow \pi^- p 4\pi^0$	NODE=M038W
190± 20	1600	ALDE	87 GAM4	$100 \pi^- p \rightarrow 4\pi^0 n$	
250± 30	7	ALDE	86D GAM4	$100 \pi^- p \rightarrow \eta\eta n$	
185 ⁺¹⁰² ₋₁₃₉	8	COSTA...	80 OMEG	$10 \pi^- p \rightarrow K^+ K^- n$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
388 ^{+ 15} _{- 21}	9	LONGACRE	86 RVUE	Compilation	
280 ^{+ 42} _{- 35}	10	CASON	82 STRC	$8 \pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$	

- 6 Breit-Wigner width.
 7 Seen in only one solution.
 8 Error increased by spread of two solutions. Included in LONGACRE 86 global analysis.
 9 From a partial-wave analysis of data using a K-matrix formalism with 5 poles. Includes compilation of several other experiments.
 10 From an amplitude analysis of the reaction $\pi^+ \pi^- \rightarrow 2\pi^0$. The resonance in the $2\pi^0$ final state is not confirmed by PROKOSHKIN 97.

NODE=M038W;LINKAGE=UE
 NODE=M038W;LINKAGE=F
 NODE=M038W;LINKAGE=A
 NODE=M038W;LINKAGE=L
 NODE=M038W;LINKAGE=P1



f₂(1810) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	
$\Gamma_2 \eta\eta$	
$\Gamma_3 4\pi^0$	seen
$\Gamma_4 K^+ K^-$	
$\Gamma_5 \gamma\gamma$	seen

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NODE=M038G01;LINKAGE=UE

NODE=M038220

NODE=M038R2
 NODE=M038R2

NODE=M038R2;LINKAGE=L

NODE=M038R;LINKAGE=C

f₂(1810) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	$\Gamma_2\Gamma_5/\Gamma$
5.2 ^{+0.9} _{-0.8} ^{+37.3} _{-4.5}	11 UEHARA	10A BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \eta\eta$
11 Including interference with the $f'_2(1525)$ (parameters fixed to the values from the 2008 edition of this review, PDG 08) and $f_2(1270)$. May also be the $f_0(1500)$.			

f₂(1810) BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ_1/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •			
not seen	AMSLER 02	CBAR	$0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$
not seen	PROKOSHKIN 97	GAM2	$38 \pi^- p \rightarrow \pi^0 \pi^0 n$
$0.21^{+0.02}_{-0.03}$	12 LONGACRE 86	RVUE	Compilation
0.44 ± 0.03	13 CASON 82	STRC	$8 \pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$

12 From a partial-wave analysis of data using a K-matrix formalism with 5 poles. Includes compilation of several other experiments.

13 Included in LONGACRE 86 global analysis.

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_2/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.008 ^{+0.028} _{-0.003}	¹⁴ LONGACRE	86	RVUE Compilation	NODE=M038R3 NODE=M038R3

¹⁴ From a partial-wave analysis of data using a K-matrix formalism with 5 poles. Includes compilation of several other experiments.

 $\Gamma(\pi\pi)/\Gamma(4\pi^0)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_1/Γ_3
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.75	ALDE	87	GAM4 100 $\pi^- p \rightarrow 4\pi^0 n$	NODE=M038R4 NODE=M038R4

 $\Gamma(4\pi^0)/\Gamma(\eta\eta)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_3/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.8±0.3	ALDE	87	GAM4 100 $\pi^- p \rightarrow 4\pi^0 n$	NODE=M038R5 NODE=M038R5

 $\Gamma(K^+K^-)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.003 ^{+0.019} _{-0.002}	¹⁵ LONGACRE	86	RVUE Compilation	NODE=M038R1 NODE=M038R1
seen	COSTA...	80	OMEG 10 $\pi^- p \rightarrow K^+ K^- n$	

¹⁵ From a partial-wave analysis of data using a K-matrix formalism with 5 poles. Includes compilation of several other experiments.

f₂(1810) REFERENCES

UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
AMSLER	02	EPJ C23 29	C. Amsler <i>et al.</i>	
PROKOSHKIN	97	SPD 42 117	Y.D. Prokoshkin <i>et al.</i>	(SERP)
		Translated from DANS 353 323.		
ALDE	88D	SJNP 47 810	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)
		Translated from YAF 47 1273.		
ALDE	87	PL B198 286	D.M. Alde <i>et al.</i>	(LANL, BRUX, SERP, LAPP)
ALDE	86D	NP B269 485	D.M. Alde <i>et al.</i>	(BELG, LAPP, SERP, CERN+)
LONGACRE	86	PL B177 223	R.S. Longacre <i>et al.</i>	(BNL, BRAN, CUNY+)
CASON	82	PRL 48 1316	N.M. Cason <i>et al.</i>	(NDAM, ANL)
COSTA...	80	NP B175 402	G. Costa de Beauregard <i>et al.</i>	(BARI, BONN+)

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NODE=M085

X(1835)

$I^G(J^{PC}) = ?^?(? - +)$

OMITTED FROM SUMMARY TABLE

Could be a superposition of two states, one with small width appearing as threshold enhancement in $p\bar{p}$, the other one with a larger width, decaying into $\pi^+\pi^-\eta'$. For the former ABLIKIM 12D determine $J^{PC} = 0(-+)$.

X(1835) MASS

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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1835.7^{+ 5.0}_{- 3.2} OUR AVERAGE

1836.5 \pm 3.0 $^{+ 5.6}_{- 2.1}$	4265	1 ABLIKIM	11C BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$	
1833.7 \pm 6.1 \pm 2.7	264	ABLIKIM	05R BES2	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1832 $^{+ 19}_{- 5}$ ± 26		2 ABLIKIM	12D BES3	$J/\psi \rightarrow \gamma p\bar{p}$	
1877.3 \pm 6.3 $^{+ 3.4}_{- 7.4}$		3 ABLIKIM	11J BES3	$J/\psi \rightarrow \omega(\eta\pi^+\pi^-)$	
1837 $^{+ 10}_{- 12}$ $^{+ 9}_{- 7}$	231	4,5 ALEXANDER	10 CLEO	$J/\psi \rightarrow \gamma p\bar{p}$	
1831 \pm 7		5,6 ABLIKIM	05R BES2	$J/\psi \rightarrow \gamma p\bar{p}$	
1859 $^{+ 3}_{- 10}$ $^{+ 5}_{- 25}$		5 BAI	03F BES2	$J/\psi \rightarrow \gamma p\bar{p}$	

¹ From a fit of the $\pi^+\pi^-\eta'$ mass distribution to a combination of $\gamma f_1(1510)$, $\gamma X(1835)$, and two unconfirmed states $\gamma X(2120)$, and $\gamma X(2370)$, for $M(p\bar{p}) < 2.8$ GeV, and accounting for backgrounds from non- η' events and $J/\psi \rightarrow \pi^0\pi^+\pi^-\eta'$.

² From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A.

³ The selected process is $J/\psi \rightarrow \omega a_0(980)\pi$. This state may be due also to $\eta_2(1870)$ or to a combination of $X(1835)$ and $\eta_2(1870)$.

⁴ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma X(1835)$, γR with $M(R) = 2100$ MeV and $\Gamma(R) = 160$ MeV, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV.

⁵ Evidence for a threshold enhancement in the $p\bar{p}$ mass spectrum was also reported by ABE 02K, AUBERT,B 05L, and WANG 05A in $B^+ \rightarrow p\bar{p}K^+$, WANG 05A in $B^0 \rightarrow p\bar{p}K_S^0$, ABE 02W in $\bar{B}^0 \rightarrow p\bar{p}D^0$, DEL-AMO-SANCHEZ 12 in $B \rightarrow D(D^*)p\bar{p}(\pi)$, and WEI 08 in $B^+ \rightarrow p\bar{p}\pi^+$ decays. Not seen by ATHAR 06 in $\Upsilon(1S) \rightarrow p\bar{p}\gamma$.

⁶ From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A. Systematic errors not estimated.

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NODE=M085M;LINKAGE=AK

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NODE=M085M;LINKAGE=AB

NODE=M085W

NODE=M085W

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	-----	------	-------------	------	---------

99 ± 50 OUR AVERAGE Error includes scale factor of 2.8.

190 \pm 9 $^{+ 38}_{- 36}$	4265	7 ABLIKIM	11C BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$	
67.7 \pm 20.3 \pm 7.7	264	ABLIKIM	05R BES2	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 76	90	8 ABLIKIM	12D BES3	$J/\psi \rightarrow \gamma p\bar{p}$	
57 \pm 12 $^{+ 19}_{- 4}$		9 ABLIKIM	11J BES3	$J/\psi \rightarrow \omega(\eta\pi^+\pi^-)$	
0 $^{+ 44}_{- 0}$	231	10,11 ALEXANDER	10 CLEO	$J/\psi \rightarrow \gamma p\bar{p}$	
< 153	90	11,12 ABLIKIM	05R BES2	$J/\psi \rightarrow \gamma p\bar{p}$	
< 30		11 BAI	03F BES2	$J/\psi \rightarrow \gamma p\bar{p}$	

OCCUR=2

NODE=M085W;LINKAGE=AI

NODE=M085W;LINKAGE=AK

NODE=M085W;LINKAGE=BL

NODE=M085W;LINKAGE=AE

⁷ From a fit of the $\pi^+\pi^-\eta'$ mass distribution to a combination of $\gamma f_1(1510)$, $\gamma X(1835)$, and two unconfirmed states $\gamma X(2120)$, and $\gamma X(2370)$, for $M(p\bar{p}) < 2.8$ GeV, and accounting for backgrounds from non- η' events and $J/\psi \rightarrow \pi^0\pi^+\pi^-\eta'$.

⁸ From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A.

⁹ The selected process is $J/\psi \rightarrow \omega a_0(980)\pi$. This state may be due also to $\eta_2(1870)$ or to a combination of $X(1835)$ and $\eta_2(1870)$.

¹⁰ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma X(1835)$, γR with $M(R) = 2100$ MeV and $\Gamma(R) = 160$ MeV, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV.

- 11 Evidence for a threshold enhancement in the $p\bar{p}$ mass spectrum was also reported by ABE 02K, AUBERT,B 05L, and WANG 05A in $B^+ \rightarrow p\bar{p}K^+$, WANG 05A in $B^0 \rightarrow p\bar{p}K_S^0$, ABE 02W in $\bar{B}^0 \rightarrow p\bar{p}D^0$, DEL-AMO-SANCHEZ 12 in $B \rightarrow D(D^*)p\bar{p}(\pi)$, and WEI 08 in $B^+ \rightarrow p\bar{p}\pi^+$ decays. Not seen by ATHAR 06 in $\Upsilon(1S) \rightarrow p\bar{p}\gamma$.
- 12 From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A. Systematic errors not estimated.

X(1835) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad p\bar{p}$	seen
$\Gamma_2 \quad \pi^+\pi^-\eta'$	seen

X(1835) BRANCHING RATIOS

$\Gamma(p\bar{p})/\Gamma(\pi^+\pi^-\eta')$	Γ_1/Γ_2		
VALUE	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
0.333	ABLIKIM	05R	BES2 $J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$

X(1835) REFERENCES

ABLIKIM	12D	PRL 108 112003	M. Ablikim <i>et al.</i>	(BES III Collab.)
DEL-AMO-SA..	12	PR D85 092017	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
ABLIKIM	11C	PRL 106 072002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11J	PRL 107 182001	M. Ablikim <i>et al.</i>	(BES III Collab.)
ALEXANDER	10	PR D82 092002	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
WEI	08	PL B659 80	J.-T. Wei <i>et al.</i>	(BELLE Collab.)
ATHAR	06	PR D73 032001	S.B. Athar <i>et al.</i>	(CLEO Collab.)
ABLIKIM	05R	PRL 95 262001	M. Ablikim <i>et al.</i>	(BES Collab.)
AUBERT,B	05L	PR D72 051101	B. Aubert <i>et al.</i>	(BABAR Collab.)
SIBIRTSEV	05A	PR D71 054010	A. Sibirtsev, J. Haidenbauer	
WANG	05A	PL B617 141	M.-Z. Wang <i>et al.</i>	(BELLE Collab.)
BAI	03F	PRC 91 022001	J.Z. Bai <i>et al.</i>	(BES II Collab.)
ABE	02K	PRL 88 181803	K. Abe <i>et al.</i>	(BELLE Collab.)
ABE	02W	PRL 89 151802	K. Abe <i>et al.</i>	(BELLE Collab.)

$\phi_3(1850)$

$$I^G(J^{PC}) = 0^-(3^{--})$$

$\phi_3(1850)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1854 \pm 7 OUR AVERAGE				
1855 \pm 10		ASTON	88E	LASS $11 K^- p \rightarrow K^- K^+ \Lambda, K_S^0 K^\pm \pi^\mp \Lambda$
1870 $^{+30}_{-20}$	430	ARMSTRONG	82	OMEG $18.5 K^- p \rightarrow K^- K^+ \Lambda$
1850 \pm 10	123	ALHARRAN	81B	HBC $8.25 K^- p \rightarrow K\bar{K}\Lambda$

$\phi_3(1850)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
87 $^{+28}_{-23}$ OUR AVERAGE Error includes scale factor of 1.2.				
64 \pm 31		ASTON	88E	LASS $11 K^- p \rightarrow K^- K^+ \Lambda, K_S^0 K^\pm \pi^\mp \Lambda$
160 $^{+90}_{-50}$	430	ARMSTRONG	82	OMEG $18.5 K^- p \rightarrow K^- K^+ \Lambda$
80 $^{+40}_{-30}$	123	ALHARRAN	81B	HBC $8.25 K^- p \rightarrow K\bar{K}\Lambda$

$\phi_3(1850)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad K\bar{K}$	seen
$\Gamma_2 \quad K\bar{K}^*(892) + \text{c.c.}$	seen

NODE=M085W;LINKAGE=HF

NODE=M085W;LINKAGE=AB

NODE=M085215;NODE=M085

DESIG=1;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow

NODE=M085220

NODE=M085R01
NODE=M085R01

NODE=M085

REFID=54269
REFID=54286
REFID=53684
REFID=53931
REFID=53525
REFID=52086
REFID=50993
REFID=50985
REFID=50827
REFID=51038
REFID=50651
REFID=49473
REFID=48690
REFID=48980

NODE=M054

NODE=M054M

NODE=M054M

NODE=M054W

NODE=M054W

NODE=M054215;NODE=M054

DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow

$\phi_3(1850)$ BRANCHING RATIOS

$\Gamma(K\bar{K}^*(892)+c.c.)/\Gamma(K\bar{K})$	Γ_2/Γ_1		
VALUE	DOCUMENT ID	TECN	COMMENT
$0.55^{+0.85}_{-0.45}$	ASTON 88E	LASS	$11 K^- p \rightarrow K^- K^+ \Lambda, K_S^0 K^\pm \pi^\mp \Lambda$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.8 ± 0.4	ALHARRAN 81B	HBC	$8.25 K^- p \rightarrow K\bar{K}\pi\Lambda$

 $\phi_3(1850)$ REFERENCES

ASTON 88E PL B208 324	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS) IGJPC
ARMSTRONG 82 PL 110B 77	T.A. Armstrong <i>et al.</i>	(BARI, BIRM, CERN+) JP
ALHARRAN 81B PL 101B 357	S. Al-Harran <i>et al.</i>	(BIRM, CERN, GLAS+)

 $\eta_2(1870)$

$$\eta^G(J^{PC}) = 0^+(2^{-+})$$

OMMITTED FROM SUMMARY TABLE

Needs confirmation.

 $\eta_2(1870)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1842± 8 OUR AVERAGE				
1835±12		BARBERIS 00B		$450 pp \rightarrow p_f \eta \pi^+ \pi^- p_s$
1844±13		BARBERIS 00C		$450 pp \rightarrow p_f 4\pi p_s$
1840±25		BARBERIS 97B	OMEg	$450 pp \rightarrow pp2(\pi^+ \pi^-)$
1875±20±35		ADOMEIT 96	CBAR	$1.94 \bar{p}p \rightarrow \eta 3\pi^0$
1881±32±40	26	KARCH 92	CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1860± 5±15		ANISOVICH 00E	SPEC	$0.9-1.94 \bar{p}p \rightarrow \eta 3\pi^0$
1840±15		BAI 99	BES	$J/\psi \rightarrow \gamma \eta \pi^+ \pi^-$

 $\eta_2(1870)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
225±14 OUR AVERAGE				
235±22		BARBERIS 00B		$450 pp \rightarrow p_f \eta \pi^+ \pi^- p_s$
228±23		BARBERIS 00C		$450 pp \rightarrow p_f 4\pi p_s$
200±40		BARBERIS 97B	OMEg	$450 pp \rightarrow pp2(\pi^+ \pi^-)$
200±25±45		ADOMEIT 96	CBAR	$1.94 \bar{p}p \rightarrow \eta 3\pi^0$
221±92±44	26	KARCH 92	CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
250±25 ⁺⁵⁰ ₋₃₅		ANISOVICH 00E	SPEC	$0.9-1.94 \bar{p}p \rightarrow \eta 3\pi^0$
170±40		BAI 99	BES	$J/\psi \rightarrow \gamma \eta \pi^+ \pi^-$

 $\eta_2(1870)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \eta \pi \pi$	
$\Gamma_2 a_2(1320)\pi$	
$\Gamma_3 f_2(1270)\eta$	
$\Gamma_4 a_0(980)\pi$	
$\Gamma_5 \gamma \gamma$	seen

 $\eta_2(1870)$ BRANCHING RATIOS

NODE=M054220

NODE=M054R1

NODE=M054R1

NODE=M054

REFID=40577

REFID=21405

REFID=21702

NODE=M101

NODE=M101

NODE=M101M

NODE=M101M

NODE=M101W

NODE=M101W

NODE=M101225; NODE=M101

DESIG=1

DESIG=4

DESIG=8

DESIG=2

DESIG=9

NODE=M101230

$\Gamma(a_2(1320)\pi)/\Gamma(f_2(1270)\eta)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_3
1.7 ± 0.4 OUR AVERAGE				
1.60 ± 0.40	1 ANISOVICH	11	SPEC 0.9–1.94 $p\bar{p}$	
20.4 ± 6.6	BARBERIS 00B		450 $pp \rightarrow p_f \eta \pi^+ \pi^- p_s$	
4.1 ± 2.3	ADOMEIT 96	CBAR	1.94 $\bar{p}p \rightarrow \eta 3\pi^0$	

1 Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

 $\Gamma(a_2(1320)\pi)/\Gamma(a_0(980)\pi)$

VALUE	DOCUMENT ID	COMMENT	Γ_2/Γ_4
32.6 ± 12.6	BARBERIS 00B	450 $pp \rightarrow p_f \eta \pi^+ \pi^- p_s$	

 $\Gamma(a_0(980)\pi)/\Gamma(f_2(1270)\eta)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ_3
0.48 ± 0.45	2 ANISOVICH 11	SPEC	0.9–1.94 $p\bar{p}$	

2 Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
seen	KARCH 92	CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$	

 $\eta_2(1870)$ REFERENCES

ANISOVICH 11	EPJ C71 1511	A.V. Anisovich <i>et al.</i>	(LOQM, RAL, PNPI)
ANISOVICH 00E	PL B477 19	A.V. Anisovich <i>et al.</i>	
BARBERIS 00B	PL B471 435	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS 00C	PL B471 440	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BAI 99	PL B446 356	J.Z. Bai <i>et al.</i>	(BES Collab.)
BARBERIS 97B	PL B413 217	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ADOMEIT 96	ZPHY C71 227	J. Adomeit <i>et al.</i>	(Crystal Barrel Collab.)
KARCH 92	ZPHY C54 33	K. Karch <i>et al.</i>	(Crystal Ball Collab.)

 $\pi_2(1880)$

$I^G(J^{PC}) = 1^-(2^-+)$

 $\pi(1880)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG COMMENT	
1895 ± 16 OUR AVERAGE					
1929 ± 24 ± 18	4k	EUGENIO 08	B852	– 18 $\pi^- p \rightarrow \eta \eta \pi^- p$	
1876 ± 11 ± 67	145k	LU 05	B852	– 18 $\pi^- p \rightarrow \omega \pi^- \pi^0 p$	
2003 ± 88 ± 148	69k	KUHN 04	B852	– 18 $\pi^- p \rightarrow \eta \pi^+ \pi^- \pi^- p$	
1880 ± 20		ANISOVICH 01B	SPEC	0 0.6–1.94 $\bar{p}p \rightarrow \eta \eta \pi^0 \pi^0$	

 $\pi(1880)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG COMMENT	
235 ± 34 OUR AVERAGE					
323 ± 87 ± 43	4k	EUGENIO 08	B852	– 18 $\pi^- p \rightarrow \eta \eta \pi^- p$	
146 ± 17 ± 62	145k	LU 05	B852	– 18 $\pi^- p \rightarrow \omega \pi^- \pi^0 p$	
306 ± 132 ± 121	69k	KUHN 04	B852	– 18 $\pi^- p \rightarrow \eta \pi^+ \pi^- \pi^- p$	
255 ± 45		ANISOVICH 01B	SPEC	0 0.6–1.94 $\bar{p}p \rightarrow \eta \eta \pi^0 \pi^0$	

 $\pi_2(1880)$ DECAY MODES

Mode					
Γ_1	$\eta \eta \pi^-$				
Γ_2	$a_0(980)\eta$				
Γ_3	$a_2(1320)\eta$				
Γ_4	$f_0(1500)\pi$				
Γ_5	$f_1(1285)\pi$				
Γ_6	$\omega \pi^- \pi^0$				

 $\Gamma(a_2(1320)\eta)/\Gamma(f_1(1285)\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_3/Γ_5
• • • We do not use the following data for averages, fits, limits, etc. • • •						
22.7 ± 7.3	69k	KUHN 04	B852	–	18 $\pi^- p \rightarrow \eta \pi^+ \pi^- \pi^- p$	

NODE=M101R2
NODE=M101R2

NODE=M101R2;LINKAGE=AN

NODE=M101R4
NODE=M101R4NODE=M101R01
NODE=M101R01

NODE=M101R01;LINKAGE=AN

NODE=M101R02
NODE=M101R02

NODE=M101

REFID=53631
REFID=47945
REFID=47958
REFID=47959
REFID=46606
REFID=45758
REFID=45202
REFID=42170

NODE=M185

NODE=M185M

NODE=M185M

NODE=M185W

NODE=M185W

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

DESIG=6

NODE=M185R01
NODE=M185R01

$\Gamma(f_0(1500)\pi)/\Gamma(a_0(980)\eta)$ **Γ_4/Γ_2**

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.28^{+0.20}_{-0.15}$	¹ ANISOVICH	01B	SPEC	0 $0.6-1.94 \bar{p}p \rightarrow \eta\eta\pi^0\pi^0$
1 Systematic errors not estimated.				

$\pi_2(1880)$ REFERENCES

EUGENIO LU KUHN ANISOVICH	08 05 04 01B	PL B660 466 PRL 94 032002 PL B595 109 PL B500 222	P. Eugenio <i>et al.</i> M. Lu <i>et al.</i> J. Kuhn <i>et al.</i> A.V. Anisovich <i>et al.</i>	(BNL E852 Collab.) (BNL E852 Collab.) (BNL E852 Collab.)
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$\rho(1900)$

$$\Gamma^G(J^{PC}) = 1^+(1^{--})$$

OMITTED FROM SUMMARY TABLE

See our mini-review under the $\rho(1700)$.

$\rho(1900)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1909 \pm 17 \pm 25$	54	¹ AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi\pi^0\gamma$
1880 ± 30		AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow 3\pi^+ 3\pi^- \gamma$
1860 ± 20		AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow 2(\pi^+ \pi^- \pi^0)\gamma$
1910 ± 10	2,3	FRABETTI	04 E687	$\gamma p \rightarrow 3\pi^+ 3\pi^- p$
1870 ± 10		ANTONELLI	96 SPEC	$e^+ e^- \rightarrow$ hadrons

1 From the fit with two resonances.

2 From a fit with two resonances with the JACOB 72 continuum.

3 Supersedes FRABETTI 01.

$\rho(1900)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$48 \pm 17 \pm 2$	54	⁴ AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi\pi^0\gamma$
130 ± 30		AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow 3\pi^+ 3\pi^- \gamma$
160 ± 20		AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow 2(\pi^+ \pi^- \pi^0)\gamma$
37 ± 13	5,6	FRABETTI	04 E687	$\gamma p \rightarrow 3\pi^+ 3\pi^- p$
10 ± 5		ANTONELLI	96 SPEC	$e^+ e^- \rightarrow$ hadrons

4 From the fit with two resonances.

5 From a fit with two resonances with the JACOB 72 continuum.

6 Supersedes FRABETTI 01.

$\rho(1900) \Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

$\Gamma(\phi\pi)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ **$\Gamma_4/\Gamma \times \Gamma_6/\Gamma$**

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$4.2 \pm 1.2 \pm 0.8$	54	⁷ AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi\pi^0\gamma$
7 From the fit with two resonances.				

$\rho(1900)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 6π	seen
Γ_2 $3\pi^+ 3\pi^-$	seen
Γ_3 $2\pi^+ 2\pi^- 2\pi^0$	
Γ_4 $\phi\pi$	
Γ_5 hadrons	seen
Γ_6 $e^+ e^-$	seen
Γ_7 NN	not seen

NODE=M185R02
NODE=M185R02

NODE=M185R02;LINKAGE=NS

NODE=M185

REFID=52160
REFID=50459
REFID=49773
REFID=48318

NODE=M170

NODE=M170

NODE=M170M

NODE=M170M

OCCUR=2

NODE=M170M;LINKAGE=AU
NODE=M170M;LINKAGE=PI
NODE=M170M;LINKAGE=RS

NODE=M170W

NODE=M170W

OCCUR=2

NODE=M170W;LINKAGE=AU
NODE=M170W;LINKAGE=PI
NODE=M170W;LINKAGE=RS

NODE=M170215

NODE=M170B01
NODE=M170B01

NODE=M170B01;LINKAGE=AU

NODE=M170225;NODE=M170

DESIG=5;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=6
DESIG=7
DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=4;OUR EST; \rightarrow UNCHECKED \leftarrow

$\rho(1900)$ BRANCHING RATIOS

$\Gamma(6\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
not seen	AGNELLO 02	OBLX	$\bar{n}p \rightarrow 3\pi^+ 2\pi^- \pi^0$	
seen	FRABETTI 01	E687	$\gamma p \rightarrow 3\pi^+ 3\pi^- p$	
seen	ANTONELLI 96	SPEC	$e^+ e^- \rightarrow \text{hadrons}$	

$\rho(1900)$ REFERENCES

AUBERT 085	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 06D	PR D73 052003	B. Aubert <i>et al.</i>	(BABAR Collab.)
FRABETTI 04	PL B578 290	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
AGNELLO 02	PL B527 39	M. Agnello <i>et al.</i>	(OBELIX Collab.)
FRABETTI 01	PL B514 240	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
ANTONELLI 96	PL B365 427	A. Antonelli <i>et al.</i>	(FENICE Collab.)
JACOB 72	PR D5 1847	M. Jacob, R. Slansky	

$f_2(1910)$

$$I^G(J^{PC}) = 0^+(2^{++})$$

OMITTED FROM SUMMARY TABLE

We list here three different peaks with close masses and widths seen in the mass distributions of $\omega\omega$, $\eta\eta'$, and K^+K^- final states. ALDE 91B argues that they are of different nature.

NODE=M170

REFID=52242
REFID=51047
REFID=49614
REFID=48576
REFID=48350
REFID=44633
REFID=49668

NODE=M142

NODE=M142

$f_2(1910)$ MASS

$f_2(1910)$ $\omega\omega$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1903± 9 OUR AVERAGE			Error includes scale factor of 1.5. See the ideogram below.
1890±10	1 AMELIN 06	VES	$36 \pi^- p \rightarrow \omega\omega n$
1934±20	ANISOVICH 00J	SPEC	
1897±11	BARBERIS 00F		$450 pp \rightarrow p_f \omega\omega p_s$
1924±14	ALDE 90	GAM2	$38 \pi^- p \rightarrow \omega\omega n$

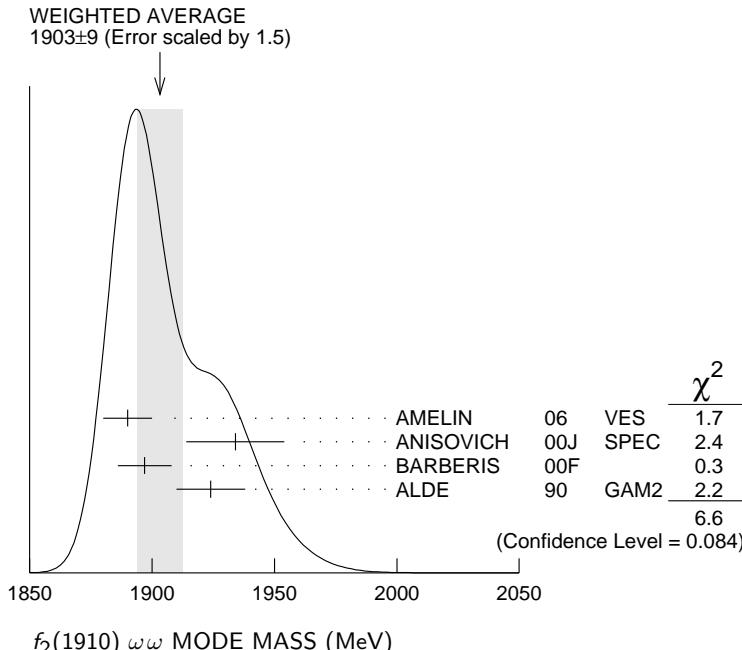
¹ Supersedes BELADIDZE 92B.

NODE=M142205

NODE=M142MX

NODE=M142M2
NODE=M142M2

NODE=M142M2;LINKAGE=AM



$f_2(1910)$ $\eta\eta'$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1934±16	2 BARBERIS 00A		$450 pp \rightarrow p_f \eta\eta' p_s$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1911±10 ALDE 91B GAM2 38 $\pi^- p \rightarrow \eta\eta' n$

² Also compatible with $J^{PC}=1^-+$.

NODE=M142M3
NODE=M142M3

NODE=M142M3;LINKAGE=KS

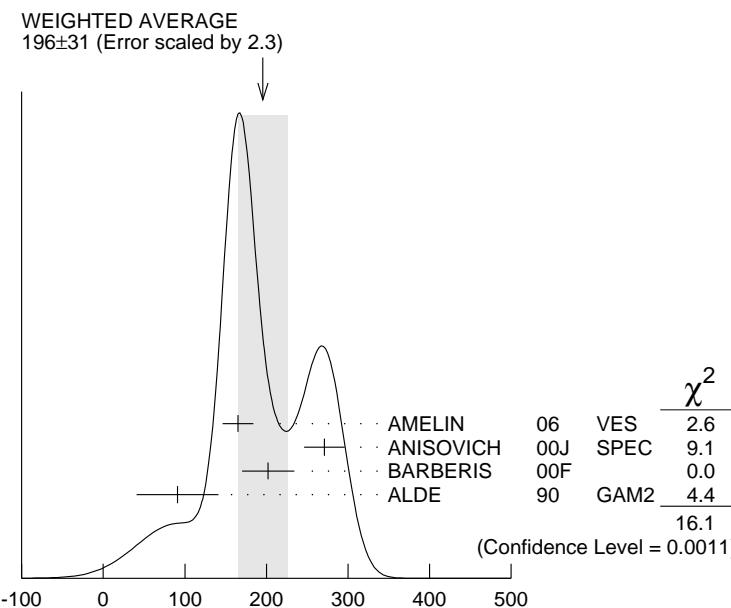
$f_2(1910)$ $K^+ K^-$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1941±18	AMSLER 06	CBAR	1.64 $\bar{p}p \rightarrow K^+ K^- \pi^0$

 $f_2(1910)$ WIDTH **$f_2(1910)$ $\omega\omega$ MODE**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
196±31 OUR AVERAGE Error includes scale factor of 2.3. See the ideogram below.			
165±19	3 AMELIN 06	VES	36 $\pi^- p \rightarrow \omega\omega n$
271±25	ANISOVICH 00J	SPEC	
202±32	BARBERIS 00F		450 $p p \rightarrow p_f \omega\omega p_s$
91±50	ALDE 90	GAM2	38 $\pi^- p \rightarrow \omega\omega n$

³ Supersedes BELADIDZE 92B.

 **$f_2(1910)$ $\omega\omega$ MODE WIDTH(MeV)** **$f_2(1910)$ $\eta\eta'$ MODE**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
141±41	4 BARBERIS 00A		450 $p p \rightarrow p_f \eta\eta' p_s$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
90±35	ALDE 91B	GAM2	38 $\pi^- p \rightarrow \eta\eta' n$

⁴ Also compatible with $J^{PC}=1^-+$.

 $f_2(1910)$ $K^+ K^-$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
120±40	AMSLER 06	CBAR	1.64 $\bar{p}p \rightarrow K^+ K^- \pi^0$

 $f_2(1910)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi^0 \pi^0$	
$\Gamma_2 K^+ K^-$	seen
$\Gamma_3 K_S^0 K_S^0$	
$\Gamma_4 \eta\eta$	seen
$\Gamma_5 \omega\omega$	seen

NODE=M142M4
NODE=M142M4

NODE=M142210

NODE=M142WX

NODE=M142W2

NODE=M142W2

NODE=M142W2;LINKAGE=AM

NODE=M142W3
NODE=M142W3

NODE=M142W3;LINKAGE=KS

NODE=M142W4
NODE=M142W4

NODE=M142215;NODE=M142

DESIG=6

DESIG=11

DESIG=8

DESIG=3;OUR EST; \rightarrow UNCHECKED
DESIG=4;OUR EST; \rightarrow UNCHECKED

Γ_6	$\eta\eta'$	seen
Γ_7	$\eta'\eta'$	
Γ_8	$\rho\rho$	seen
Γ_9	$a_2(1320)\pi$	seen
Γ_{10}	$f_2(1270)\eta$	seen

DESIG=5;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=9
 DESIG=10;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=12;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=13;OUR EST; \rightarrow UNCHECKED \leftarrow

$f_2(1910)$ BRANCHING RATIOS

$\Gamma(K^+K^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
seen	AMSLER 06	CBAR	1.64 $\bar{p}p \rightarrow K^+K^-\pi^0$	

$\Gamma(\pi^0\pi^0)/\Gamma(\eta\eta')$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ_6
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
<0.1	ALDE 89	GAM2	38 $\pi^- p \rightarrow \eta\eta' n$	

$\Gamma(K_S^0K_S^0)/\Gamma(\eta\eta')$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_6
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.066	90	BALOSHIN 86	SPEC	$40\pi p \rightarrow K_S^0K_S^0 n$	

$\Gamma(\eta\eta)/\Gamma(\eta\eta')$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ_6
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<0.05	90	ALDE 91B	GAM2	38 $\pi^- p \rightarrow \eta\eta' n$	

$\Gamma(\omega\omega)/\Gamma(\eta\eta')$

VALUE	DOCUMENT ID	COMMENT	Γ_5/Γ_6
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
2.6±0.6	BARBERIS 00F	450 $pp \rightarrow p_f \omega\omega p_s$	

$\Gamma(\eta'\eta')/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
probably not seen	BARBERIS 00A	450	$pp \rightarrow p_f \eta'\eta' p_s$	
possibly seen	BELADIDZE 92D VES	37	$\pi^- p \rightarrow \eta'\eta' n$	

$\Gamma(\rho\rho)/\Gamma(\omega\omega)$

VALUE	DOCUMENT ID	COMMENT	Γ_8/Γ_5
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
2.6±0.4	BARBERIS 00F	450 $pp \rightarrow p_f \omega\omega p_s$	

$\Gamma(f_2(1270)\eta)/\Gamma(a_2(1320)\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{10}/Γ_9
0.09±0.05	ANISOVICH 11	SPEC	0.9–1.94 $p\bar{p}$	

5 Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

$f_2(1910)$ REFERENCES

ANISOVICH	11	EPJ C71 1511	A.V. Anisovich <i>et al.</i>	(LOQM, RAL, PNPI)
AMELIN	06	PAN 69 690	D.V. Amelin <i>et al.</i>	(VES Collab.)
		Translated from YAF 69 715.		
AMSLER	06	PL B639 165	C. Amsler <i>et al.</i>	(CBAR Collab.)
ANISOVICH	00E	PL B477 19	A.V. Anisovich <i>et al.</i>	
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
BARBERIS	00A	PL B471 429	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS	00F	PL B484 198	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ADOMEIT	96	ZPHY C71 227	J. Adomeit <i>et al.</i>	(Crystal Barrel Collab.)
BELADIDZE	92B	ZPHY C54 367	G.M. Beladidze <i>et al.</i>	(VES Collab.)
BELADIDZE	92D	ZPHY C57 13	G.M. Beladidze <i>et al.</i>	(VES Collab.)
ALDE	91B	SJNP 54 455	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)
		Translated from YAF 54 751.		
Also		PL B276 375	D.M. Alde <i>et al.</i>	(BELG, SERP, KEK, LANL+)
ALDE	90	PL B241 600	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)
ALDE	89	PL B216 447	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP)
Also		SJNP 48 1035	D.M. Alde <i>et al.</i>	(BELG, SERP, LANL, LAPP)
Translated from YAF 48 1724.				
BALOSHIN	86	SJNP 43 959	O.N. Baloshin <i>et al.</i>	(ITEP)
		Translated from YAF 43 1487.		

DESIG=5;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=9
 DESIG=10;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=12;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=13;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M142225

NODE=M142R11

NODE=M142R11

NODE=M142R4

NODE=M142R4

NODE=M142R7

NODE=M142R7

NODE=M142R6

NODE=M142R6

NODE=M142R10

NODE=M142R10

NODE=M142R8

NODE=M142R8

NODE=M142R9

NODE=M142R9

NODE=M142R12

NODE=M142R12

NODE=M142R12;LINKAGE=AN

NODE=M142

REFID=53631

REFID=51574

REFID=51136

REFID=47945

REFID=47950

REFID=47957

REFID=47962

REFID=45202

REFID=42172

REFID=43309

REFID=41844

REFID=41911

REFID=40935

REFID=40727

REFID=44697

REFID=40734

$f_2(1950)$ $I^G(J^{PC}) = 0^+(2^{++})$

NODE=M135

 $f_2(1950)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1944±12 OUR AVERAGE			Error includes scale factor of 1.5. See the ideogram below.
1930±25	¹ BINON	05 GAMS	33 $\pi^- p \rightarrow \eta\eta n$
2010±25	ANISOVICH	00J SPEC	
1940±50	BAI	00A BES	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^+\pi^-)$
1980±22	² BARBERIS	00C	450 $pp \rightarrow pp4\pi$
1940±22	³ BARBERIS	00C	450 $pp \rightarrow pp2\pi^0\pi^0$
1980±50	ANISOVICH	99B SPEC	1.35–1.94 $p\bar{p} \rightarrow \eta\eta\pi^0$
1960±30	BARBERIS	97B OMEG	450 $pp \rightarrow pp2(\pi^+\pi^-)$
1918±12	ANTINORI	95 OMEG	300,450 $pp \rightarrow pp2(\pi^+\pi^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2038 ⁺¹³⁺¹² ₋₁₁₋₇₃	⁴ UEHARA	09 BELL	10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
1980± 2±14	ABE	04 BELL	10.6 $e^+e^- \rightarrow e^+e^-K^+K^-$
1867±46	⁵ AMSLER	02 CBAR	0.9 $\bar{p}p \rightarrow \pi^0\eta\eta, \pi^0\pi^0\pi^0$
~1990	⁶ OAKDEN	94 RVUE	0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
1950±15	⁷ ASTON	91 LASS	11 $K^-p \rightarrow \Lambda K\bar{K}\pi\pi$

1 First solution, PWA is ambiguous.

2 Decaying into $\pi^+\pi^-2\pi^0$.3 Decaying into $2(\pi^+\pi^-)$.4 Taking into account $f_4(2050)$.

5 T-matrix pole.

6 From solution B of amplitude analysis of data on $\bar{p}p \rightarrow \pi\pi$. See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J=3$ to be important but not significantly resonant.

7 Cannot determine spin to be 2.

NODE=M135M

NODE=M135M

OCCUR=2

NODE=M135M;LINKAGE=BI

NODE=M135M;LINKAGE=A4

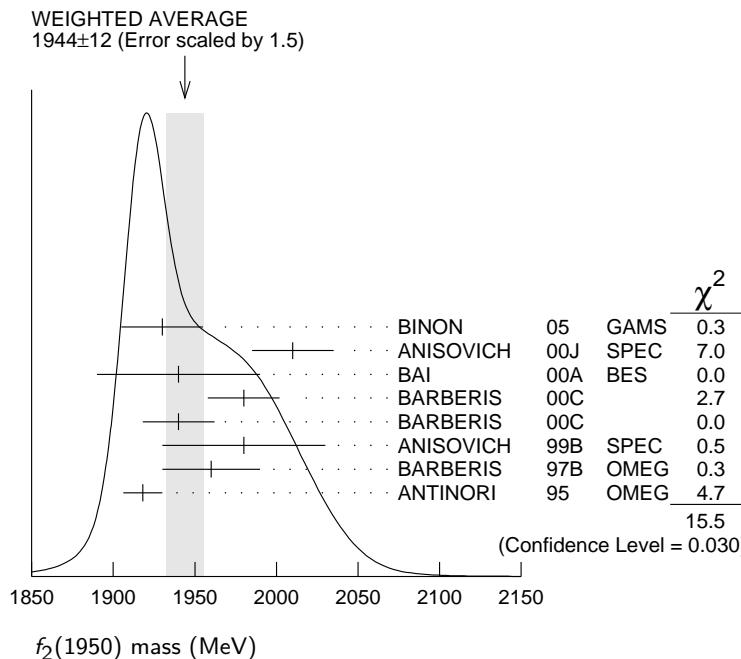
NODE=M135M;LINKAGE=B4

NODE=M135M;LINKAGE=UE

NODE=M135M;LINKAGE=TT

NODE=M135M;LINKAGE=BB

NODE=M135M;LINKAGE=A

 **$f_2(1950)$ WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
472± 18 OUR AVERAGE			
450± 50	⁸ BINON	05 GAMS	33 $\pi^- p \rightarrow \eta\eta n$
495± 35	ANISOVICH	00J SPEC	
380 ⁺¹²⁰ ₋₉₀	BAI	00A BES	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^+\pi^-)$
520± 50	⁹ BARBERIS	00C	450 $pp \rightarrow pp4\pi$

NODE=M135W

NODE=M135W

485 ± 55	10	BARBERIS	00C	450 $p\bar{p} \rightarrow p\bar{p}4\pi$
500 ± 100		ANISOVICH	99B	SPEC 1.35–1.94 $p\bar{p} \rightarrow \eta\eta\pi^0$
460 ± 40		BARBERIS	97B	OMEG 450 $p\bar{p} \rightarrow p\bar{p}2(\pi^+\pi^-)$
390 ± 60		ANTINORI	95	OMEG 300,450 $p\bar{p} \rightarrow p\bar{p}2(\pi^+\pi^-)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

441 + 27 + 28 25 – 192	11	UEHARA	09	BELL 10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
297 ± 12 ± 6		ABE	04	BELL 10.6 $e^+e^- \rightarrow e^+e^-K^+K^-$
385 ± 58	12	AMSLER	02	CBAR 0.9 $\bar{p}p \rightarrow \pi^0\eta\eta, \pi^0\pi^0\pi^0$
~ 100	13	OAKDEN	94	RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
250 ± 50	14	ASTON	91	LASS 11 $K^-p \rightarrow \Lambda K\bar{K}\pi\pi$

8 First solution, PWA is ambiguous.

9 Decaying into $\pi^+\pi^-2\pi^0$.

10 Decaying into $2(\pi^+\pi^-)$.

11 Taking into account $f_4(2050)$.

12 T-matrix pole.

13 From solution B of amplitude analysis of data on $\bar{p}p \rightarrow \pi\pi$. See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.

14 Cannot determine spin to be 2.

OCCUR=2

NODE=M135W;LINKAGE=BI
NODE=M135W;LINKAGE=A4
NODE=M135W;LINKAGE=B4
NODE=M135W;LINKAGE=UE
NODE=M135W;LINKAGE=TT
NODE=M135W;LINKAGE=BB

NODE=M135W;LINKAGE=A

NODE=M135215;NODE=M135

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K^*(892)\bar{K}^*(892)$	seen
$\Gamma_2 \pi\pi$	
$\Gamma_3 \pi^+\pi^-$	seen
$\Gamma_4 \pi^0\pi^0$	seen
$\Gamma_5 4\pi$	seen
$\Gamma_6 \pi^+\pi^-\pi^+\pi^-$	
$\Gamma_7 a_2(1320)\pi$	
$\Gamma_8 f_2(1270)\pi\pi$	
$\Gamma_9 \eta\eta$	seen
$\Gamma_{10} K\bar{K}$	seen
$\Gamma_{11} \gamma\gamma$	seen
$\Gamma_{12} p\bar{p}$	seen

$f_2(1950) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{10}\Gamma_{11}/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

122 ± 4 ± 26	15	ABE	04	BELL 10.6 $e^+e^- \rightarrow e^+e^-K^+K^-$
15 Assuming spin 2.				

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_{11}/\Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

162 + 69 + 1137 – 42 – 204	16	UEHARA	09	BELL 10.6 $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
-------------------------------	----	--------	----	---

16 Taking into account $f_4(2050)$.

NODE=M135225

NODE=M135G1
NODE=M135G1

NODE=M135G1;LINKAGE=AB

NODE=M135G2
NODE=M135G2

NODE=M135G2;LINKAGE=UE

NODE=M135220

NODE=M135R1
NODE=M135R1

NODE=M135R3
NODE=M135R3

$\Gamma(K^*(892)\bar{K}^*(892))/\Gamma_{\text{total}}$	Γ_1/Γ			
VALUE	DOCUMENT ID	TECN	CHG	COMMENT
seen	ASTON	91	LASS	0 11 $K^-p \rightarrow \Lambda K\bar{K}\pi\pi$

$\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$	Γ_7/Γ		
VALUE	DOCUMENT ID	TECN	COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen	BARBERIS	00B	450 $p\bar{p} \rightarrow p_f\eta\pi^+\pi^-p_s$
not seen	BARBERIS	00C	450 $p\bar{p} \rightarrow p_f4\pi p_s$
possibly seen	BARBERIS	97B	OMEG 450 $p\bar{p} \rightarrow p\bar{p}2(\pi^+\pi^-)$

$\Gamma(\eta\eta)/\Gamma(4\pi)$				Γ_9/Γ_5
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<5.0 \times 10^{-3}$	90	BARBERIS 00E	$450 \text{ pp} \rightarrow p_f \eta\eta p_s$	
$\Gamma(\eta\eta)/\Gamma(\pi^+\pi^-)$				Γ_9/Γ_3
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.14 ± 0.05	AMSLER 02	CBAR	$0.9 \bar{p}p \rightarrow \pi^0 \eta\eta, \pi^0 \pi^0 \pi^0$	
$\Gamma(p\bar{p})/\Gamma_{\text{total}}$				Γ_{12}/Γ
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
seen	111	ALEXANDER 10	CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$

$f_2(1950)$ REFERENCES

ALEXANDER 10	PR D82 092002	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
UEHARA 09	PR D79 052009	S. Uehara <i>et al.</i>	(BELLE Collab.)
BINON 05	PAN 68 960	F. Binon <i>et al.</i>	
	Translated from YAF 68 998.		
ABE 04	EPJ C32 323	K. Abe <i>et al.</i>	(BELLE Collab.)
AMSLER 02	EPJ C23 29	C. Amsler <i>et al.</i>	
ANISOVICH 00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
BAI 00A	PL B472 207	J.Z. Bai <i>et al.</i>	(BES Collab.)
BARBERIS 00B	PL B471 435	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS 00C	PL B471 440	D. Barberis <i>et al.</i>	(WA 102 Collab.)
BARBERIS 00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ANISOVICH 99B	PL B449 154	A.V. Anisovich <i>et al.</i>	
BARBERIS 97B	PL B413 217	D. Barberis <i>et al.</i>	(WA 102 Collab.)
KLOET 96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)
ANTINORI 95	PL B353 589	F. Antinori <i>et al.</i>	(ATHU, BARI, BIRM+) JP
OAKDEN 94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)
ASTON 91	NPBPS B21 5	D. Aston <i>et al.</i>	(LASS Collab.)

$\rho_3(1990)$

$$\mathcal{I}^G(J^{PC}) = 1^+(3^-^-)$$

OMMITTED FROM SUMMARY TABLE

$\rho_3(1990)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1982 ± 14	1 ANISOVICH 02	SPEC	$0.6-1.9 \bar{p}p \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
~ 2007	HASAN 94	RVUE	$\bar{p}p \rightarrow \pi\pi$

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$\rho_3(1990)$ WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
188 ± 24	2 ANISOVICH 02	SPEC	$0.6-1.9 \bar{p}p \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
~ 287	HASAN 94	RVUE	$\bar{p}p \rightarrow \pi\pi$

² From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$\rho_3(1990)$ REFERENCES

ANISOVICH 02	PL B542 8	A.V. Anisovich <i>et al.</i>	
ANISOVICH 01D	PL B508 6	A.V. Anisovich <i>et al.</i>	
ANISOVICH 01E	PL B513 281	A.V. Anisovich <i>et al.</i>	
ANISOVICH 00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
HASAN 94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)

NODE=M135R5
NODE=M135R5

NODE=M135R6
NODE=M135R6

NODE=M135R07
NODE=M135R07

NODE=M135

REFID=53525
REFID=52761
REFID=50780

REFID=49650
REFID=48580
REFID=47950
REFID=47426
REFID=47958
REFID=47959
REFID=47961
REFID=46886
REFID=45758
REFID=45212
REFID=44437
REFID=45210
REFID=41746

NODE=M167

NODE=M167M

NODE=M167M

NODE=M167M;LINKAGE=AY

NODE=M167W

NODE=M167W

NODE=M167W;LINKAGE=AY

NODE=M167

REFID=48828
REFID=48327
REFID=48349
REFID=47950
REFID=44103

$f_2(2010)$ $I^G(J^{PC}) = 0^+(2^{++})$

NODE=M106

 $f_2(2010)$ MASSVALUE (MeV)DOCUMENT IDTECNCOMMENT**2011 $^{+62}_{-76}$** ¹ ETKIN

88

MPS

22 $\pi^- p \rightarrow \phi\phi n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2005 ± 12

VLADIMIRSK...06

SPEC

40 $\pi^- p \rightarrow K_S^0 K_S^0 n$ 1980 ± 20

2 BOLONKIN

88

SPEC

40 $\pi^- p \rightarrow K_S^0 K_S^0 n$ 2050 $^{+90}_{-50}$

ETKIN

85

MPS

22 $\pi^- p \rightarrow 2\phi n$ 2120 $^{+20}_{-120}$

LINDENBAUM 84

RVUE

2160 ± 50

ETKIN

82

MPS

22 $\pi^- p \rightarrow 2\phi n$ ¹ Includes data of ETKIN 85. The percentage of the resonance going into $\phi\phi 2^{++} S_2$, D_2 , and D_0 is 98_{-3}^{+1} , 0_{-0}^{+1} , and 2_{-1}^{+2} , respectively.² Statistically very weak, only 1.4 s.d.

NODE=M106M

NODE=M106M

 $f_2(2010)$ WIDTHVALUE (MeV)DOCUMENT IDTECNCOMMENT**202 $^{+67}_{-62}$** ³ ETKIN

88

MPS

22 $\pi^- p \rightarrow \phi\phi n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

209 ± 32

VLADIMIRSK...06

SPEC

40 $\pi^- p \rightarrow K_S^0 K_S^0 n$ 145 ± 50

4 BOLONKIN

88

SPEC

40 $\pi^- p \rightarrow K_S^0 K_S^0 n$ 200 $^{+160}_{-50}$

ETKIN

85

MPS

22 $\pi^- p \rightarrow 2\phi n$ 300 $^{+150}_{-50}$

LINDENBAUM 84

RVUE

310 ± 70

ETKIN

82

MPS

22 $\pi^- p \rightarrow 2\phi n$ ³ Includes data of ETKIN 85.⁴ Statistically very weak, only 1.4 s.d.

NODE=M106M;LINKAGE=C

NODE=M106M;LINKAGE=E

NODE=M106W

NODE=M106W

 $f_2(2010)$ DECAY MODES

Mode

Fraction (Γ_i/Γ) $\Gamma_1 \phi\phi$

seen

 $\Gamma_2 K\bar{K}$

seen

NODE=M106W;LINKAGE=C

NODE=M106W;LINKAGE=E

NODE=M106215;NODE=M106

 $f_2(2010)$ BRANCHING RATIOS $\Gamma(K\bar{K})/\Gamma_{\text{total}}$ Γ_2/Γ VALUEDOCUMENT IDTECNCOMMENT

seen

VLADIMIRSK...06

SPEC

40 $\pi^- p \rightarrow K_S^0 K_S^0 n$

NODE=M106

REFID=51191

REFID=40580

REFID=40285

REFID=21871

REFID=21869

REFID=21866

REFID=21867

 $f_2(2010)$ REFERENCES

VLADIMIRSK... 06	PAN 69 493 Translated from YAF 69 515.	V.V. Vladimirsy <i>et al.</i>	(ITEP, Moscow)
BOLONKIN 88	NP B309 426	B.V. Bolonkin <i>et al.</i>	(ITEP, SERP)
ETKIN 88	PL B201 568	A. Etkin <i>et al.</i>	(BNL, CUNY)
ETKIN 85	PL 165B 217	A. Etkin <i>et al.</i>	(BNL, CUNY)
LINDENBAUM 84	CNPP 13 285	S.J. Lindenbaum	(CUNY)
ETKIN 82	PRL 49 1620	A. Etkin <i>et al.</i>	(BNL, CUNY)
Also	Brighton Conf. 351	S.J. Lindenbaum	(BNL, CUNY)

(ITEP, Moscow)

(ITEP, SERP)

(BNL, CUNY)

(BNL, CUNY)

(CUNY)

(BNL, CUNY)

(BNL, CUNY)

$f_0(2020)$ $I^G(J^{PC}) = 0^+(0^{++})$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

$f_0(2020)$ MASS					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1992±16	1,2	BARBERIS	00C	450 $p\bar{p} \rightarrow p_f 4\pi p_s$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2037± 8	80k	3 UMAN	06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
2040±38		ANISOVICH	00J	SPEC	
2010±60		ALDE	98	GAM4	100 $\pi^- p \rightarrow \pi^0\pi^0 n$
2020±35		BARBERIS	97B	OMEG	450 $p\bar{p} \rightarrow p\bar{p}2(\pi^+\pi^-)$

1 Average between $\pi^+\pi^- 2\pi^0$ and $2(\pi^+\pi^-)$.

2 T-matrix pole.

3 Statistical error only.

$f_0(2020)$ WIDTH					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
442± 60	4,5	BARBERIS	00C	450 $p\bar{p} \rightarrow p_f 4\pi p_s$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
296± 17	80k	6 UMAN	06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
405± 40		ANISOVICH	00J	SPEC	
240±100		ALDE	98	GAM4	100 $\pi^- p \rightarrow \pi^0\pi^0 n$
410± 50		BARBERIS	97B	OMEG	450 $p\bar{p} \rightarrow p\bar{p}2(\pi^+\pi^-)$

4 Average between $\pi^+\pi^- 2\pi^0$ and $2(\pi^+\pi^-)$.

5 T-matrix pole.

6 Statistical error only.

$f_0(2020)$ DECAY MODES					
Mode	Fraction (Γ_i/Γ)				
$\Gamma_1 \rho\pi\pi$	seen				
$\Gamma_2 \pi^0\pi^0$	seen				
$\Gamma_3 \rho\rho$	seen				
$\Gamma_4 \omega\omega$	seen				
$\Gamma_5 \eta\eta$	seen				

$f_0(2020)$ BRANCHING RATIOS					
$\Gamma(\rho\rho)/\Gamma(\omega\omega)$	DOCUMENT ID	Γ_3/Γ_4			
VALUE	DOCUMENT ID	COMMENT			
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 3	BARBERIS	00F	450 $p\bar{p} \rightarrow p_f \omega\omega p_s$		
$\Gamma(\eta\eta)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ_5/Γ		
seen	UMAN	06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$	

$f_0(2020)$ REFERENCES					
UMAN	06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)	
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>		
BARBERIS	00C	PL B471 440	D. Barberis <i>et al.</i>	(WA 102 Collab.)	
BARBERIS	00F	PL B484 198	D. Barberis <i>et al.</i>	(WA 102 Collab.)	
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)	
Also		PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)	
		Translated from YAF 62 446.			
BARBERIS	97B	PL B413 217	D. Barberis <i>et al.</i>	(WA 102 Collab.)	

NODE=M156

NODE=M156M

NODE=M156M

NODE=M156M;LINKAGE=PC

NODE=M156M;LINKAGE=PP

NODE=M156M;LINKAGE=ST

NODE=M156W

NODE=M156W

NODE=M156W;LINKAGE=PC

NODE=M156W;LINKAGE=PP

NODE=M156W;LINKAGE=ST

NODE=M156215;NODE=M156

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=2;OUR EST;→ UNCHECKED ←
DESIG=3;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=5

NODE=M156220

NODE=M156R1

NODE=M156R1

NODE=M156R01

NODE=M156R01

NODE=M156

REFID=51063

REFID=47950

REFID=47959

REFID=47962

REFID=46605

REFID=46914

REFID=45758

$a_4(2040)$ $I^G(J^{PC}) = 1^-(4^{++})$

NODE=M017

 $a_4(2040)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1996^{+10}_{-9} OUR AVERAGE		Error includes scale factor of 1.1.			
1885 \pm 13 $^{+50}_{-2}$	420k	ALEKSEEV	10	COMP	$190 \pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
1985 \pm 10 \pm 13	145k	LU	05	B852	$18 \pi^- p \rightarrow \omega \pi^- \pi^0 p$
1996 \pm 25 \pm 43		CHUNG	02	B852	$18.3 \pi^- p \rightarrow 3\pi p$
2005 $^{+25}_{-45}$	1 ANISOVICH	01F	SPEC		$2.0 \bar{p}p \rightarrow 3\pi^0, \pi^0 \eta, \pi^0 \eta'$
2000 \pm 40 $^{+60}_{-20}$		IVANOV	01	B852	$18 \pi^- p \rightarrow \eta' \pi^- p$
1944 \pm 8 \pm 50	2 AMELIN	99	VES		$37 \pi^- A \rightarrow \omega \pi^- \pi^0 A^*$
2010 \pm 20	3 DONSKOV	96	GAM2	0	$38 \pi^- p \rightarrow \eta \pi^0 n$
2040 \pm 30	4 CLELAND	82B	SPEC	\pm	$50 \pi p \rightarrow K_S^0 K^\pm p$
2030 \pm 50	5 CORDEN	78C	OMEG	0	$15 \pi^- p \rightarrow 3\pi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2004 \pm 6	80k	6 UMAN	06	E835	$5.2 \bar{p}p \rightarrow \eta \eta \pi^0$
1903 \pm 10		7 BALDI	78	SPEC	$- 10 \pi^- p \rightarrow p K_S^0 K^-$

- 1 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.
 2 May be a different state.
 3 From a simultaneous fit to the G_+ and G_0 wave intensities.
 4 From an amplitude analysis.
 5 $J^P = 4^+$ is favored, though $J^P = 2^+$ cannot be excluded.
 6 Statistical error only.
 7 From a fit to the Y_8^0 moment. Limited by phase space.

NODE=M017M

NODE=M017M

 $a_4(2040)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
255^{+28}_{-24} OUR AVERAGE		Error includes scale factor of 1.3. See the ideogram below.			
294 \pm 25 $^{+46}_{-19}$	420k	ALEKSEEV	10	COMP	$190 \pi^- Pb \rightarrow \pi^- \pi^- \pi^+ Pb'$
231 \pm 30 \pm 46	145k	LU	05	B852	$18 \pi^- p \rightarrow \omega \pi^- \pi^0 p$
298 \pm 81 \pm 85		CHUNG	02	B852	$18.3 \pi^- p \rightarrow 3\pi p$
180 \pm 30	8 ANISOVICH	01F	SPEC		$2.0 \bar{p}p \rightarrow 3\pi^0, \pi^0 \eta, \pi^0 \eta'$
350 \pm 100 $^{+70}_{-50}$		IVANOV	01	B852	$18 \pi^- p \rightarrow \eta' \pi^- p$
324 \pm 26 \pm 75	9 AMELIN	99	VES		$37 \pi^- A \rightarrow \omega \pi^- \pi^0 A^*$
370 \pm 80	10 DONSKOV	96	GAM2	0	$38 \pi^- p \rightarrow \eta \pi^0 n$
380 \pm 150	11 CLELAND	82B	SPEC	\pm	$50 \pi p \rightarrow K_S^0 K^\pm p$
510 \pm 200	12 CORDEN	78C	OMEG	0	$15 \pi^- p \rightarrow 3\pi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
401 \pm 16	80k	13 UMAN	06	E835	$5.2 \bar{p}p \rightarrow \eta \eta \pi^0$
166 \pm 43		14 BALDI	78	SPEC	$- 10 \pi^- p \rightarrow p K_S^0 K^-$

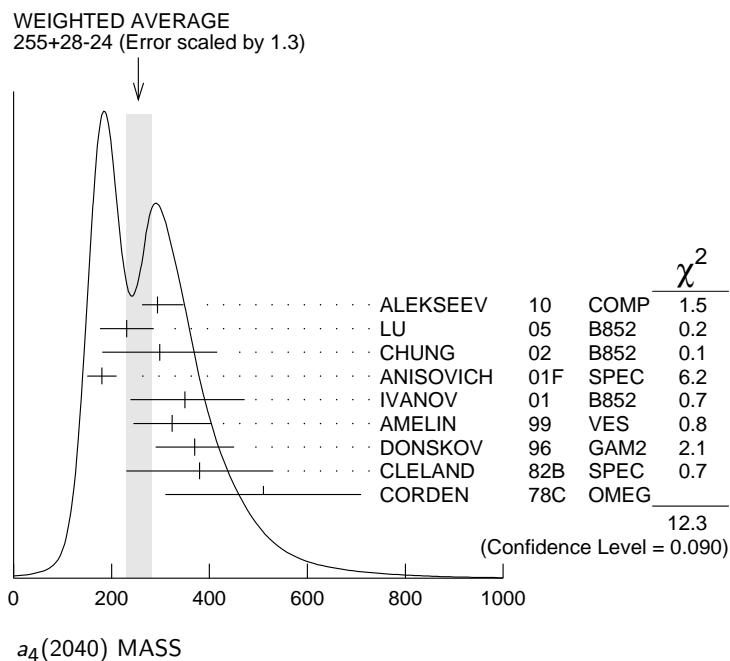
- 8 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.
 9 May be a different state.
 10 From a simultaneous fit to the G_+ and G_0 wave intensities.
 11 From an amplitude analysis.
 12 $J^P = 4^+$ is favored, though $J^P = 2^+$ cannot be excluded.
 13 Statistical error only.
 14 From a fit to the Y_8^0 moment. Limited by phase space.

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NODE=M017W

NODE=M017W

NODE=M017W;LINKAGE=AN
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NODE=M017W;LINKAGE=C
NODE=M017W;LINKAGE=M
NODE=M017W;LINKAGE=ST
NODE=M017W;LINKAGE=Y

**a₄(2040) DECAY MODES**

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\bar{K}$	seen
$\Gamma_2 \pi^+ \pi^- \pi^0$	seen
$\Gamma_3 \rho\pi$	seen
$\Gamma_4 f_2(1270)\pi$	seen
$\Gamma_5 \omega\pi^-\pi^0$	seen
$\Gamma_6 \omega\rho$	seen
$\Gamma_7 \eta\pi^0$	seen
$\Gamma_8 \eta'(958)\pi$	seen

a₄(2040) BRANCHING RATIOS

$\Gamma(K\bar{K})/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
seen	BALDI 78 SPEC ± 10 $\pi^- p \rightarrow K_S^0 K^- p$
$\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$	Γ_2/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
seen	CORDEN 78C OMEG 0 15 $\pi^- p \rightarrow 3\pi n$
$\Gamma(\rho\pi)/\Gamma(f_2(1270)\pi)$	Γ_3/Γ_4
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
1.1±0.2±0.2	CHUNG 02 B852 18.3 $\pi^- p \rightarrow 3\pi p$
$\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$	Γ_7/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
seen	DONSKOV 96 GAM2 0 38 $\pi^- p \rightarrow \eta\pi^0 n$
$\Gamma(\omega\rho)/\Gamma_{\text{total}}$	Γ_6/Γ
<u>VALUE</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
seen	145k LU 05 B852 18 $\pi^- p \rightarrow \omega\pi^-\pi^0 p$

NODE=M017215;NODE=M017

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DESIG=2

DESIG=5;OUR EST;→ UNCHECKED ←

DESIG=6;OUR EST;→ UNCHECKED ←

DESIG=7;OUR EST;→ UNCHECKED ←

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DESIG=4;OUR EST;→ UNCHECKED ←

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NODE=M017R2

NODE=M017R4

NODE=M017R4

NODE=M017R3

NODE=M017R3

NODE=M017R5

NODE=M017R5

a₄(2040) REFERENCES

ALEKSEEV UMAN LU CHUNG ANISOVICH IVANOV AMELIN	10 06 05 02 01F 01 99	PRL 104 241803 PR D73 052009 PRL 94 032002 PR D65 072001 PL B517 261 PR 86 3977 PAN 62 445	M.G. Alekseev <i>et al.</i> I. Uman <i>et al.</i> M. Lu <i>et al.</i> S.U. Chung <i>et al.</i> A.V. Anisovich <i>et al.</i> E.I. Ivanov <i>et al.</i> D.V. Amelin <i>et al.</i>	(COMPASS Collab.) (FNAL E835) (BNL E852 Collab.) (BNL E852 Collab.) (BNL E852 Collab.) (VES Collab.)
		Translated from YAF 62 487.		
ANISOVICH ANISOVICH DONSKOV	99C 99E 96	PL B452 173 PL B452 187 PAN 59 982	A.V. Anisovich <i>et al.</i> A.V. Anisovich <i>et al.</i> S.V. Donskov <i>et al.</i>	(GAMS Collab.) IGJPC
CLELAND BALDI CORDEN	82B 78 78C	NP B208 228 PL 74B 413 NP B136 77	W.E. Cleland <i>et al.</i> R. Baldi <i>et al.</i> M.J. Corden <i>et al.</i>	(DURH, GEVA, LAUS+) (GEVA) JP (BIRM, RHEL, TELA+) JP

f₄(2050)

$$I^G(J^{PC}) = 0^+(4^{++})$$

f₄(2050) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2018±11 OUR AVERAGE				Error includes scale factor of 2.1. See the ideogram below.
1960±15		AMELIN	06	VES $36 \pi^- p \rightarrow \omega \omega n$
2005±10		1 BINON	05	GAMS $33 \pi^- p \rightarrow \eta \eta n$
1998±15		ALDE	98	GAM4 $100 \pi^- p \rightarrow \pi^0 \pi^0 n$
2060±20		ALDE	90	GAM2 $38 \pi^- p \rightarrow \omega \omega n$
2038±30		AUGUSTIN	87	DM2 $J/\psi \rightarrow \gamma \pi^+ \pi^-$
2086±15		BALTRUSAIT..	87	MRK3 $J/\psi \rightarrow \gamma \pi^+ \pi^-$
2000±60		ALDE	86D	GAM4 $100 \pi^- p \rightarrow n 2\eta$
2020±20	40k	2 BINON	84B	GAM2 $38 \pi^- p \rightarrow n 2\pi^0$
2015±28		3 CASON	82	STRC $8 \pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$
2031 ⁺²⁵ ₋₃₆		ETKIN	82B	MPS $23 \pi^- p \rightarrow n 2K_S^0$
2020±30	700	APEL	75	NICE $40 \pi^- p \rightarrow n 2\pi^0$
2050±25		BLUM	75	ASPK $18.4 \pi^- p \rightarrow n K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1966±25		4 ANISOVICH	09	RVUE $0.0 \bar{p}p, \pi N$
1885 ⁺¹⁴⁺²¹⁸ ₋₁₃₋₂₅		5 UEHARA	09	BELL $10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
2018± 6		ANISOVICH	00J	SPEC $2.0 \bar{p}p \rightarrow \eta \pi^0 \pi^0, \pi^0 \pi^0, \eta \eta, \eta \eta', \pi \pi$
~ 2000		6 MARTIN	98	RVUE $N\bar{N} \rightarrow \pi \pi$
~ 2010		7 MARTIN	97	RVUE $\bar{N}N \rightarrow \pi \pi$
~ 2040		8 OAKDEN	94	RVUE $0.36-1.55 \bar{p}p \rightarrow \pi \pi$
~ 1990		9 OAKDEN	94	RVUE $0.36-1.55 \bar{p}p \rightarrow \pi \pi$
1978± 5		10 ALPER	80	CNTR $62 \pi^- p \rightarrow K^+ K^- n$
2040±10		10 ROZANSKA	80	SPRK $18 \pi^- p \rightarrow p \bar{p}n$
1935±13		10 CORDEN	79	OMEG $12-15 \pi^- p \rightarrow n 2\pi$
1988± 7		EVANGELIS...	79B	OMEG $10 \pi^- p \rightarrow K^+ K^- n$
1922±14		11 ANTIPOV	77	CIBS $25 \pi^- p \rightarrow p 3\pi$

1 From the first PWA solution.

2 From a partial-wave analysis of the data.

3 From an amplitude analysis of the reaction $\pi^+ \pi^- \rightarrow 2\pi^0$.

4 K matrix pole.

5 Taking into account the $f_2(1950)$. Helicity-2 production favored.

6 Energy-dependent analysis.

7 Single energy analysis.

8 From solution A of amplitude analysis of data on $\bar{p}p \rightarrow \pi \pi$. See however KLOET 96 who fit $\pi^+ \pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.9 From solution B of amplitude analysis of data on $\bar{p}p \rightarrow \pi \pi$. See however KLOET 96 who fit $\pi^+ \pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.10 $I(J^P) = 0(4^+)$ from amplitude analysis assuming one-pion exchange.11 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

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NODE=M016

NODE=M016M

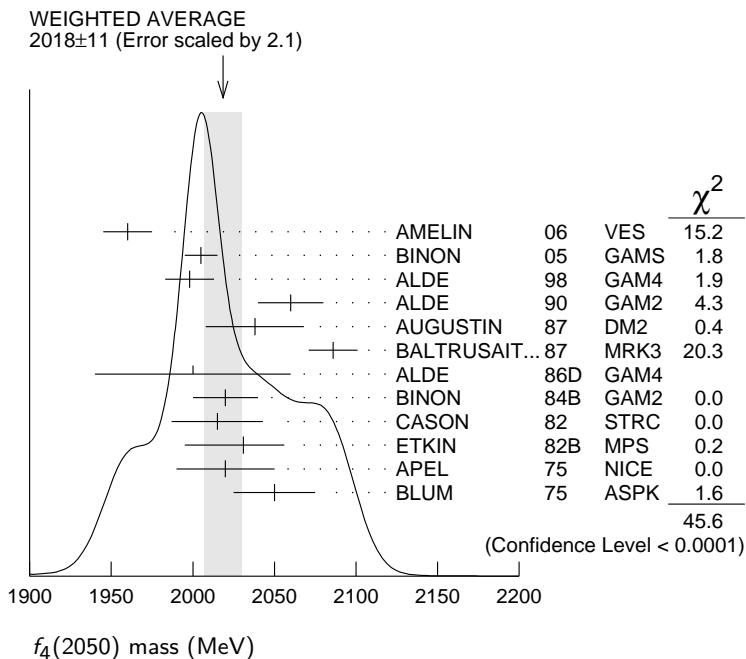
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OCCUR=2

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NODE=M016M;LINKAGE=B

NODE=M016M;LINKAGE=BB

NODE=M016M;LINKAGE=M
NODE=M016M;LINKAGE=T

**f₄(2050) WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
237± 18 OUR AVERAGE				Error includes scale factor of 1.9. See the ideogram below.
290± 20		AMELIN	06	$\pi^- p \rightarrow \omega \omega n$
340± 80	12	BINON	05	$\pi^- p \rightarrow \eta \eta n$
395± 40		ALDE	98	$\pi^- p \rightarrow \pi^0 \pi^0 n$
170± 60		ALDE	90	$\pi^- p \rightarrow \omega \omega n$
304± 60		AUGUSTIN	87	$J/\psi \rightarrow \gamma \pi^+ \pi^-$
210± 63		BALTRUSAIT...	87	$J/\psi \rightarrow \gamma \pi^+ \pi^-$
400± 100		ALDE	86D	$\pi^- p \rightarrow n 2\eta$
240± 40	40k	13 BINON	84B	$\pi^- p \rightarrow n 2\pi^0$
190± 14		DENNEY	83	$\pi^+ n / \pi^+ p$
186 ⁺¹⁰³ ₋₅₈		14 CASON	82	$\pi^+ p \rightarrow \Delta^{++} \pi^0 \pi^0$
305 ⁺³⁶ ₋₁₁₉		ETKIN	82B	$\pi^- p \rightarrow n 2K_S^0$
180± 60	700	APEL	75	$\pi^- p \rightarrow n 2\pi^0$
225 ⁺¹²⁰ ₋₇₀		BLUM	75	$\pi^- p \rightarrow n K^+ K^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

260± 40	15	ANISOVICH	09	$\bar{p}p, \pi N$
453± 20 ⁺³¹ ₋₁₂₉	16	UEHARA	09	$e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
182± 7		ANISOVICH	00J	$2.0 \bar{p}p \rightarrow \eta \pi^0 \pi^0, \pi^0 \pi^0, \eta \eta, \eta \eta', \pi \pi$
~ 170	17	MARTIN	98	$N\bar{N} \rightarrow \pi \pi$
~ 200	18	MARTIN	97	$\bar{N}\bar{N} \rightarrow \pi \pi$
~ 60	19	OAKDEN	94	$0.36-1.55 \bar{p}p \rightarrow \pi \pi$
~ 80	20	OAKDEN	94	$0.36-1.55 \bar{p}p \rightarrow \pi \pi$
243± 16	21	ALPER	80	$\pi^- p \rightarrow K^+ K^- n$
140± 15	21	ROZANSKA	80	$\pi^- p \rightarrow p \bar{p}n$
263± 57	21	CORDEN	79	$\pi^- p \rightarrow n 2\pi$
100± 28		EVANGELIS...	79B	$\pi^- p \rightarrow K^+ K^- n$
107± 56	22	ANTIFOV	77	$\pi^- p \rightarrow p 3\pi$

12 From the first PWA solution.

13 From a partial-wave analysis of the data.

14 From an amplitude analysis of the reaction $\pi^+ \pi^- \rightarrow 2\pi^0$.

15 K matrix pole.

16 Taking into account the $f_2(1950)$. Helicity-2 production favored.

17 Energy-dependent analysis.

18 Single energy analysis.

NODE=M016W

NODE=M016W

OCCUR=2

NODE=M016W;LINKAGE=BI

NODE=M016W;LINKAGE=N

NODE=M016W;LINKAGE=NN

NODE=M016W;LINKAGE=KM

NODE=M016W;LINKAGE=UE

NODE=M016W;LINKAGE=RB

NODE=M016W;LINKAGE=BR

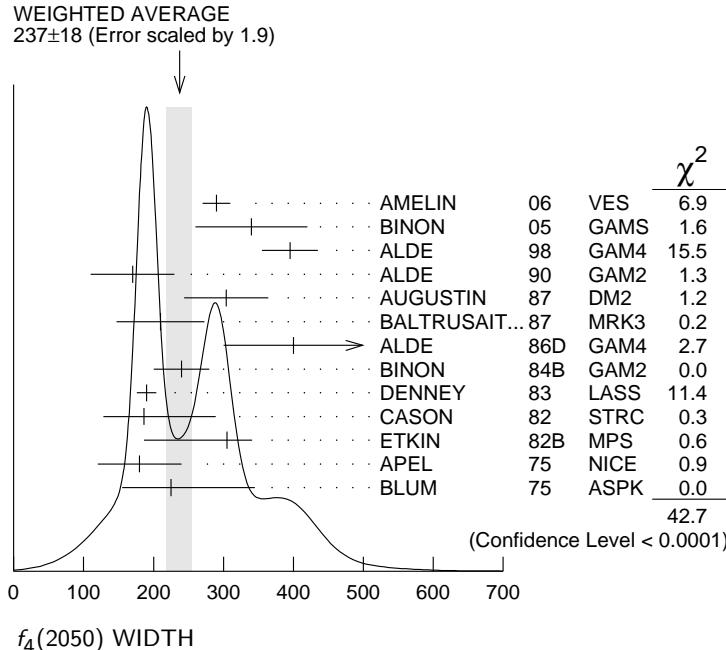
- 19 From solution A of amplitude analysis of data on $\bar{p}p \rightarrow \pi\pi$. See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.
- 20 From solution B of amplitude analysis of data on $\bar{p}p \rightarrow \pi\pi$. See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.
- 21 $I(J^P) = 0(4^+)$ from amplitude analysis assuming one-pion exchange.
- 22 Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

NODE=M016W;LINKAGE=BW

NODE=M016W;LINKAGE=BB

NODE=M016W;LINKAGE=M

NODE=M016W;LINKAGE=T

**f₄(2050) DECAY MODES**

NODE=M016215;NODE=M016

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \omega\omega$	seen
$\Gamma_2 \pi\pi$	$(17.0 \pm 1.5)\%$
$\Gamma_3 K\bar{K}$	$(6.8^{+3.4}_{-1.8}) \times 10^{-3}$
$\Gamma_4 \eta\eta$	$(2.1 \pm 0.8) \times 10^{-3}$
$\Gamma_5 4\pi^0$	< 1.2 %
$\Gamma_6 \gamma\gamma$	
$\Gamma_7 a_2(1320)\pi$	seen

DESIG=6

DESIG=1

DESIG=2

DESIG=3

DESIG=5

DESIG=4

DESIG=7

f₄(2050) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_3\Gamma_6/\Gamma$
VALUE (keV)	CL%
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
<0.29	95 ALTHOFF 85B TASS $\gamma\gamma \rightarrow K\bar{K}\pi$

NODE=M016220

NODE=M016G2

NODE=M016G2

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_6/\Gamma$
VALUE (eV)	CL% EVTS DOCUMENT ID TECN COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	

NODE=M016G3

NODE=M016G3

$23.1^{+3.6+70.5}_{-3.3-15.6}$	23 UEHARA 09 BELL $10.6 e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
<1100	95 13 ± 4 OEST 90 JADE $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$
$\bullet \bullet \bullet$ Taking into account the $f_2(1950)$. Helicity-2 production favored.	

NODE=M016G3;LINKAGE=UE

$\Gamma(\omega\omega)/\Gamma_{\text{total}}$	Γ_1/Γ
seen	AMELIN 06 VES $36 \pi^- p \rightarrow \omega\omega n$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
not seen	BARBERIS 00F $450 pp \rightarrow p_f \omega\omega p_s$

NODE=M016225

NODE=M016R7

NODE=M016R7

$\Gamma(\omega\omega)/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.5±0.3	ALDE	90	GAM2 38 $\pi^- p \rightarrow \omega\omega n$

 Γ_1/Γ_2

NODE=M016R5
NODE=M016R5

 $\Gamma(\pi\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.170±0.015 OUR AVERAGE			

0.18 ± 0.03	24 BINON	83C	GAM2 38 $\pi^- p \rightarrow n4\gamma$
0.16 ± 0.03	24 CASON	82	STRC 8 $\pi^+ p \rightarrow \Delta^+ \pi^0 \pi^0$
0.17 ± 0.02	24 CORDEN	79	OMEG 12–15 $\pi^- p \rightarrow n2\pi$

24 Assuming one pion exchange.

 Γ_2/Γ

NODE=M016R1
NODE=M016R1

 $\Gamma(K\bar{K})/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04+0.02 -0.01	ETKIN	82B	MPS 23 $\pi^- p \rightarrow n2K_S^0$

 Γ_3/Γ_2

NODE=M016R2
NODE=M016R2

 $\Gamma(\eta\eta)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.1±0.8	ALDE	86D	GAM4 100 $\pi^- p \rightarrow n4\gamma$

 Γ_4/Γ

NODE=M016R3
NODE=M016R3

 $\Gamma(4\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.012	ALDE	87	GAM4 100 $\pi^- p \rightarrow 4\pi^0 n$

 Γ_5/Γ

NODE=M016R4
NODE=M016R4

 $\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
seen	AMELIN	00	VES 37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

 Γ_7/Γ

NODE=M016R6
NODE=M016R6

f₄(2050) REFERENCES

ANISOVICH 09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
UEHARA 09	PR D79 052009	S. Uehara <i>et al.</i>	(BELLE Collab.)
AMELIN 06	PAN 69 690	D.V. Amelin <i>et al.</i>	(VES Collab.)
BINON 05	PAN 68 960	F. Binon <i>et al.</i>	
AMELIN 00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)
ANISOVICH 00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
BARBERIS 00F	PL B484 198	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ALDE 98	EPJ A3 361	D. Alde <i>et al.</i>	(GAM4 Collab.)
Also	PAN 62 405	D. Alde <i>et al.</i>	(GAMS Collab.)
MARTIN 98	PR C57 3492	B.R. Martin <i>et al.</i>	
MARTIN 97	PR C56 1114	B.R. Martin, G.C. Oades	(LOUC, AARH)
KLOET 96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)
OAKDEN 94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)
ALDE 90	PL B241 600	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)
OEST 90	ZPHY C47 343	T. Oest <i>et al.</i>	(JADE Collab.)
ALDE 87	PL B198 286	D.M. Alde <i>et al.</i>	(LANL, BRUX, SERP, LAPP)
AUGUSTIN 87	ZPHY C36 369	J.E. Augustin <i>et al.</i>	(LAUO, CLER, FRAS+)
BALTRUSAIT... 87	PR D35 2077	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
ALDE 86D	NP B269 485	D.M. Alde <i>et al.</i>	(BELG, LAPP, SERP, CERN+)
ALTHOFF 85B	ZPHY C29 189	M. Althoff <i>et al.</i>	(TASSO Collab.)
BINON 84B	LNC 39 41	F.G. Binoit <i>et al.</i>	(SERP, BELG, LAPP)
BINON 83C	SJNP 38 723	F.G. Binoit <i>et al.</i>	(SERP, BRUX+)
DENNEY 83	PR D28 2726	D.L. Denney <i>et al.</i>	(IOWA, MICH)
CASON 82	PRL 48 1316	N.M. Cason <i>et al.</i>	(NDAM, ANL)
ETKIN 82B	PR D25 1786	A. Etkin <i>et al.</i>	(BNL, CUNY, TUFTS, VAND)
ALPER 80	PL 94B 422	B. Alper <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)
ROZANSKA 80	NP B162 505	M. Rozanska <i>et al.</i>	(MPIM, CERN)
CORDEN 79	NP B157 250	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+) JP
EVANGELIST... 79B	NP B154 381	C. Evangelista <i>et al.</i>	(BARI, BOHN, CERN+) JP
ANTIPOV 77	NP B119 45	Y.M. Antipov <i>et al.</i>	(SERP, GEVA)
APEL 75	PL 57B 398	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA, SERP+) JP
BLUM 75	PL 57B 403	W. Blum <i>et al.</i>	(CERN, MPIM) JP

NODE=M016

REFID=52719
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REFID=50780

REFID=47432

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REFID=20374

REFID=21967

REFID=20728

REFID=20720

REFID=21651

$\pi_2(2100)$ $I^G(J^{PC}) = 1^-(2^-+)$

OMMITTED FROM SUMMARY TABLE

Needs confirmation.

 $\pi_2(2100)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2090± 29 OUR AVERAGE			
2090± 30	1 AMELIN	95B VES	36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$
2100±150	2 DAUM	81B CNTR	63,94 $\pi^- p \rightarrow 3\pi X$

¹ From a fit to $J^{PC} = 2^-+$ $f_2(1270)\pi$, $(\pi\pi)_S\pi$ waves.
² From a two-resonance fit to four 2^-0^+ waves.

 $\pi_2(2100)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
625± 50 OUR AVERAGE Error includes scale factor of 1.2.			
520±100	3 AMELIN	95B VES	36 $\pi^- A \rightarrow \pi^+ \pi^- \pi^- A$
651± 50	4 DAUM	81B CNTR	63,94 $\pi^- p \rightarrow 3\pi X$

³ From a fit to $J^{PC} = 2^-+$ $f_2(1270)\pi$, $(\pi\pi)_S\pi$ waves.
⁴ From a two-resonance fit to four 2^-0^+ waves.

 $\pi_2(2100)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 3π	seen
Γ_2 $\rho\pi$	seen
Γ_3 $f_2(1270)\pi$	seen
Γ_4 $(\pi\pi)_S\pi$	seen

 $\pi_2(2100)$ BRANCHING RATIOS

$\Gamma(\rho\pi)/\Gamma(3\pi)$	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_1
0.19±0.05	5 DAUM	81B CNTR	63,94 $\pi^- p$	

$\Gamma(f_2(1270)\pi)/\Gamma(3\pi)$	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_1
0.36±0.09	5 DAUM	81B CNTR	63,94 $\pi^- p$	

$\Gamma((\pi\pi)_S\pi)/\Gamma(3\pi)$	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ_1
0.45±0.07	5 DAUM	81B CNTR	63,94 $\pi^- p$	

D-wave/S-wave RATIO FOR $\pi_2(2100) \rightarrow f_2(1270)\pi$	DOCUMENT ID	TECN	COMMENT
0.39±0.23	5 DAUM	81B CNTR	63,94 $\pi^- p$

5 From a two-resonance fit to four 2^-0^+ waves. **$\pi_2(2100)$ REFERENCES**

AMELIN DAUM	95B PL B356 595 81B NP B182 269	D.V. Amelin <i>et al.</i> C. Daum <i>et al.</i>	(SERP, TBIL) (AMST, CERN, CRAC, MPIM+)
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NODE=M020

NODE=M020

NODE=M020M

NODE=M020M

NODE=M020M;LINKAGE=AX
NODE=M020M;LINKAGE=L

NODE=M020W

NODE=M020W

NODE=M020W;LINKAGE=AX
NODE=M020W;LINKAGE=L

NODE=M020215;NODE=M020

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DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=4;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M020220

NODE=M020R1
NODE=M020R1NODE=M020R2
NODE=M020R2NODE=M020R3
NODE=M020R3NODE=M020R4
NODE=M020R4

NODE=M020R;LINKAGE=L

NODE=M020

REFID=44433
REFID=20872

$f_0(2100)$ $I^G(J^{PC}) = 0^+(0^{++})$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

$f_0(2100)$ MASS					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2103± 8 OUR AVERAGE					
2102±13		¹ ANISOVICH 00J	SPEC	2.0 $\bar{p}p \rightarrow \eta\pi^0\pi^0, \pi^0\pi^0,$ $\eta\eta, \eta\eta', \pi^+\pi^-$	
2090±30		BAI 00A	BES	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^+\pi^-)$	
2105±10		ANISOVICH 99K	SPEC	0.6–1.94 $\bar{p}p \rightarrow \eta\eta, \eta\eta'$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2105± 8	80k	² UMAN 06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$	
~2104		BUGG 95		$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$	
~2122		HASAN 94	RVUE	$\bar{p}p \rightarrow \pi\pi$	
1 Includes the data of ANISOVICH 00B indicating to exotic decay pattern.					
2 Statistical error only.					

NODE=M168

NODE=M168M

NODE=M168M

$f_0(2100)$ WIDTH					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
209± 19 OUR AVERAGE					
211± 29		³ ANISOVICH 00J	SPEC	2.0 $\bar{p}p \rightarrow \eta\pi^0\pi^0, \pi^0\pi^0,$ $\eta\eta, \eta\eta', \pi^+\pi^-$	
330±100		BAI 00A	BES	$J/\psi \rightarrow \gamma(\pi^+\pi^-\pi^+\pi^-)$	
200± 25		ANISOVICH 99K	SPEC	0.6–1.94 $\bar{p}p \rightarrow \eta\eta, \eta\eta'$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
236± 14	80k	⁴ UMAN 06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$	
~203		BUGG 95		$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$	
~273		HASAN 94	RVUE	$\bar{p}p \rightarrow \pi\pi$	
3 Includes the data of ANISOVICH 00B indicating to exotic decay pattern.					
4 Statistical error only.					

NODE=M168M;LINKAGE=AN
NODE=M168M;LINKAGE=ST

NODE=M168W

NODE=M168W

NODE=M168W;LINKAGE=AN
NODE=M168W;LINKAGE=ST

NODE=M168

REFID=51063
REFID=47942
REFID=47950
REFID=47426
REFID=47472
REFID=44438
REFID=44103

$f_0(2100)$ REFERENCES					
UMAN 06	PR D73 052009	I. Uman <i>et al.</i>		(FNAL E835)	
ANISOVICH 00B	NP A662 319	A.V. Anisovich <i>et al.</i>			
ANISOVICH 00J	PL B491 47	A.V. Anisovich <i>et al.</i>			
BAI 00A	PL B472 207	J.Z. Bai <i>et al.</i>		(BES Collab.)	
ANISOVICH 99K	PL B468 309	A.V. Anisovich <i>et al.</i>			
BUGG 95	PL B353 378	D.V. Bugg <i>et al.</i>		(LOQM, PNPI, WASH)	
HASAN 94	PL B334 215	A. Hasan, D.V. Bugg		(LOQM)	

$f_2(2150)$ $I^G(J^{PC}) = 0^+(2^{++})$

OMITTED FROM SUMMARY TABLE

This entry was previously called T_0 . **$f_2(2150)$ MASS** **$f_2(2150)$ MASS, COMBINED MODES (MeV)**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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2157±12 OUR AVERAGE Includes data from the 2 datablocks that follow this one.

• • • We do not use the following data for averages, fits, limits, etc. • • •

2170± 6 80k 1 UMAN 06 E835 5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$

1 Statistical error only.

 $\eta\eta$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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The data in this block is included in the average printed for a previous datablock.

2157±12 OUR AVERAGE2151±16 BARBERIS 00E 450 $p p \rightarrow p_f \eta\eta p_s$
2175±20 PROKOSHKIN 95D GAM4 300 $\pi^- N \rightarrow \pi^- N 2\eta$,
450 $p p \rightarrow p p 2\eta$ 2130±35 SINGOVSKI 94 GAM4 450 $p p \rightarrow p p 2\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2140±30 2 ABELE 99B CBAR

2104±20 3 ARMSTRONG 93C E760 $\bar{p}p \rightarrow \pi^0 \eta\eta \rightarrow 6\gamma$

2 Spin not determined.

3 No J^{PC} determination. **$\eta\pi\pi$ MODE**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

• • • We do not use the following data for averages, fits, limits, etc. • • •

2135±20±45 4 ADOMEIT 96 CBAR 0 1.94 $\bar{p}p \rightarrow \eta 3\pi^0$ 4 ANISOVICH 00E recommends to withdraw ADOMEIT 96 that assumed a single $J^P = 2^+$ resonance. **$\bar{p}p \rightarrow \pi\pi$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

~2090 5 OAKDEN 94 RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~2120 6 OAKDEN 94 RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~2170 7 MARTIN 80B RVUE
~2150 7 MARTIN 80C RVUE
~2150 8 DULUDE 78B OSPK 1–2 $\bar{p}p \rightarrow \pi^0 \pi^0$ 5 OAKDEN 94 makes an amplitude analysis of LEAR data on $\bar{p}p \rightarrow \pi\pi$ using a method based on Barrelet zeros. This is solution A. The amplitude analysis of HASAN 94 includes earlier data as well, and assume that the data can be parametrized in terms of towers of nearly degenerate resonances on the leading Regge trajectory. See also KLOET 96 and MARTIN 97 who make related analyses.6 From solution B of amplitude analysis of data on $\bar{p}p \rightarrow \pi\pi$.7 $I(J^P) = 0(2^+)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.8 $I^G(J^{PC}) = 0^+(2^+)$ from partial-wave amplitude analysis.**S-CHANNEL $\bar{p}p$, $\bar{N}N$ or $\bar{K}K$**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

2139 $^{+8}_{-9}$ 9 EVANGELIS... 97 SPEC 0.6–2.4 $\bar{p}p \rightarrow K_S^0 K_S^0$
~2190 9 CUTTS 78B CNTR 0.97–3 $\bar{p}p \rightarrow \bar{N}N$
2155±15 9,10 COUPLAND 77 CNTR 0 0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
2193± 2 9,11 ALSPECTOR 73 CNTR $\bar{p}p$ S channel

9 Isospins 0 and 1 not separated.

10 From a fit to the total elastic cross section.

11 Referred to as T or T region by ALSPECTOR 73.

NODE=M042

NODE=M042

NODE=M042205

NODE=M042M

NODE=M042M

NODE=M042M;LINKAGE=ST

NODE=M042M3

NODE=M042M3

NODE=M042M3;LINKAGE=K3
NODE=M042M3;LINKAGE=ANODE=M042M4
NODE=M042M4

NODE=M042M4;LINKAGE=AD

NODE=M042M1
NODE=M042M1

OCCUR=2

NODE=M042M1;LINKAGE=B

NODE=M042M1;LINKAGE=BB

NODE=M042M1;LINKAGE=P

NODE=M042M1;LINKAGE=L

NODE=M042M2

NODE=M042M2

NODE=M042M2;LINKAGE=I

NODE=M042M2;LINKAGE=E

NODE=M042M2;LINKAGE=M

$K\bar{K}$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2200±13	VLADIMIRSK...06	SPEC 40	$\pi^- p \rightarrow K_S^0 K_S^0 n$
2150±20	ABLIKIM 04E	BES2	$J/\psi \rightarrow \omega K^+ K^-$
2130±35	BARBERIS 99	OMEG 450	$p p \rightarrow p_s p_f K^+ K^-$

NODE=M042M5
NODE=M042M5

 $f_2(2150)$ WIDTH **$f_2(2150)$ WIDTH, COMBINED MODES (MeV)**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
152±30 OUR AVERAGE Includes data from the 2 datablocks that follow this one. Error includes scale factor of 1.4. See the ideogram below.				

• • • We do not use the following data for averages, fits, limits, etc. • • •

182±11	80k	12 UMAN	06 E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
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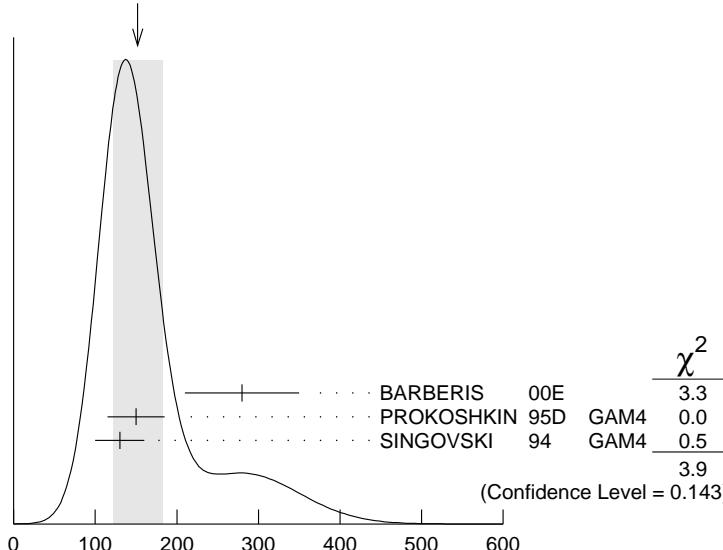
12 Statistical error only.

NODE=M042210

NODE=M042W
NODE=M042W

NODE=M042W;LINKAGE=ST

WEIGHTED AVERAGE
152±30 (Error scaled by 1.4)

 **$\eta\eta$ MODE**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.			

NODE=M042W3
NODE=M042W3

152±30 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.

280±70	BARBERIS 00E	450 $p p \rightarrow p_f \eta\eta p_s$
150±35	PROKOSHKIN 95D	GAM4 300 $\pi^- N \rightarrow \pi^- N 2\eta$, 450 $p p \rightarrow p p 2\eta$
130±30	SINGOVSKI 94	GAM4 450 $p p \rightarrow p p 2\eta$

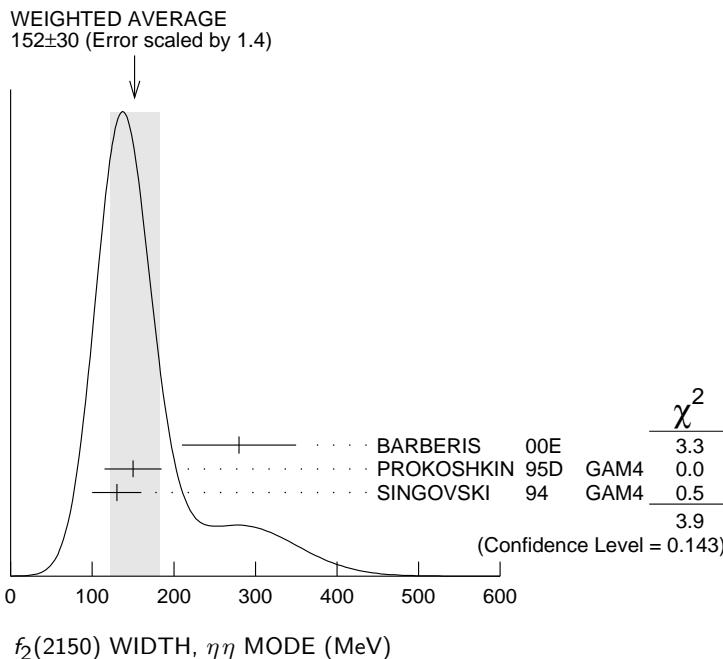
• • • We do not use the following data for averages, fits, limits, etc. • • •

310±50	13 ABELE	99B CBAR
203±10	14 ARMSTRONG	93C E760 $\bar{p}p \rightarrow \pi^0 \eta\eta \rightarrow 6\gamma$

13 Spin not determined.

14 No JPC determination.

NODE=M042W3;LINKAGE=K3
NODE=M042W3;LINKAGE=A

 **$\eta\pi\pi$ MODE**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
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The data in this block is included in the average printed for a previous datablock.

• • • We do not use the following data for averages, fits, limits, etc. • • •

250±25±45	15 ADOMEIT 96	CBAR 0	1.94	$\bar{p}p \rightarrow \eta 3\pi^0$
15 ANISOVICH 00E recommends to withdraw ADOMEIT 96 that assumed a single $J^P = 2^+$ resonance.				

 $\bar{p}p \rightarrow \pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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250 OUR ESTIMATE

• • • We do not use the following data for averages, fits, limits, etc. • • •

~ 70	16 OAKDEN 94	RVUE	0.36–1.55	$\bar{p}p \rightarrow \pi\pi$
~ 250	17 MARTIN 80B	RVUE		
~ 250	17 MARTIN 80C	RVUE		
~ 250	18 DULUDE 78B	OSPK	1–2	$\bar{p}p \rightarrow \pi^0\pi^0$

16 See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.

17 $I(J^P) = 0(2^+)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.

18 $I^G(J^P) = 0^+(2^+)$ from partial-wave amplitude analysis.

S-CHANNEL $\bar{p}p$, $\bar{N}N$ or $\bar{K}K$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

56 ⁺³¹ ₋₁₆	19 EVANGELIS... 97	SPEC	0.6–2.4	$\bar{p}p \rightarrow K_S^0 K_S^0$
135±75	20,21 COUPLAND 77	CNTR 0	0.7–2.4	$\bar{p}p \rightarrow \bar{p}p$
98± 8	21 ALSPECTOR 73	CNTR		$\bar{p}p$ S channel

19 Isospin 0 and 2 not separated.

20 From a fit to the total elastic cross section.

21 Isospins 0 and 1 not separated.

 $\bar{K}K$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

91±62	VLADIMIRSK... 06	SPEC	40	$\pi^- p \rightarrow K_S^0 K_S^0 n$
150±30	ABLIKIM 04E	BES2	$J/\psi \rightarrow \omega K^+ K^-$	
270±50	BARBERIS 99	OMEG	450	$p_s p_f K^+ K^-$

NODE=M042W4
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NODE=M042W4;LINKAGE=AD

NODE=M042W1
NODE=M042W1
→ UNCHECKED ←

NODE=M042W1;LINKAGE=CC

NODE=M042W1;LINKAGE=P
NODE=M042W1;LINKAGE=L

NODE=M042W2
NODE=M042W2

NODE=M042W2;LINKAGE=F
NODE=M042W2;LINKAGE=E
NODE=M042W2;LINKAGE=I

NODE=M042W5
NODE=M042W5

f₂(2150) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	
$\Gamma_2 \eta\eta$	seen
$\Gamma_3 K\bar{K}$	seen
$\Gamma_4 f_2(1270)\eta$	seen
$\Gamma_5 a_2(1320)\pi$	seen
$\Gamma_6 p\bar{p}$	seen

f₂(2150) BRANCHING RATIOS

$\Gamma(K\bar{K})/\Gamma(\eta\eta)$	Γ_3/Γ_2
VALUE 1.28±0.23	DOCUMENT ID BARBERIS 00E TECN 450 pp → $p_f \eta\eta p_s$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.1	95	22 PROKOSHIN 95D GAM4	300 $\pi^- N \rightarrow \pi^- N 2\eta$, 450 pp → pp2η
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22 Using data from ARMSTRONG 89d.

$\Gamma(\pi\pi)/\Gamma(\eta\eta)$	Γ_1/Γ_2
VALUE 0.33	DOCUMENT ID PROKOSHIN 95D GAM4 TECN 300 $\pi^- N \rightarrow \pi^- N 2\eta$, 450 pp → pp2η

23 Derived from a $\pi^0 \pi^0/\eta\eta$ limit.

$\Gamma(f_2(1270)\eta)/\Gamma(a_2(1320)\pi)$	Γ_4/Γ_5
VALUE 0.79±0.11	DOCUMENT ID ADOMEIT 96 TECN 1.94 $\bar{p}p \rightarrow \eta 3\pi^0$

24 Using $B(a_2(1320) \rightarrow \eta\pi) = 0.145$

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$	Γ_6/Γ
VALUE seen	DOCUMENT ID ALEXANDER 10 CLEO TECN $\psi(2S) \rightarrow \gamma p\bar{p}$

f₂(2150) REFERENCES

ALEXANDER 10	PR D82 092002	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
UMAN 06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)
VLADIMIRSKY 06	PAN 69 493	V.V. Vladimirska <i>et al.</i>	(ITEP, Moscow)
		Translated from YAF 69 515.	
ABLIKIM 04E	PL B603 138	M. Ablikim <i>et al.</i>	(BES Collab.)
ANISOVICH 00E	PL B477 19	A.V. Anisovich <i>et al.</i>	
BARBERIS 00E	PL B479 59	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ABELE 99B	EPJ C8 67	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
BARBERIS 99	PL B453 305	D. Barberis <i>et al.</i>	(Omega Expt.)
EVANGELIS... 97	PR D56 3803	C. Evangelista <i>et al.</i>	(LEAR Collab.)
MARTIN 97	PR C56 1114	B.R. Martin, G.C. Oades	(LOUC, AARH)
ADOMEIT 96	ZPHY C71 227	J. Adomeit <i>et al.</i>	(Crystal Barrel Collab.)
KLOET 96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)
PROKOSHIN 95D	SPD 40 495	Y.D. Prokoshkin	(SERP) IGJPC
		Translated from DANS 344 469.	
HASAN 94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)
OAKDEN 94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)
SINGOVSKI 94	NC 107A 1911	A.V. Singovsky	(SERP)
ARMSTRONG 93C	PL B307 394	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
ARMSTRONG 89D	PL B227 186	T.A. Armstrong, M. Benayoun	(ATHU, BARI, BIRM+)
MARTIN 80B	NP B176 355	B.R. Martin, D. Morgan	(LOUC, RHEL) JP
MARTIN 80C	NP B169 216	A.D. Martin, M.R. Pennington	(DURH) JP
CUTTS 78B	PR D17 16	D. Cutts <i>et al.</i>	(STON, WISC)
DULUDE 78B	PL 79B 335	R.S. Dulude <i>et al.</i>	(BROW, MIT, BARI) JP
COUPLAND 77	PL 71B 460	M. Coupland <i>et al.</i>	(LOQM, RHEL)
ALSPECTOR 73	PRL 30 511	J. Alspector <i>et al.</i>	(RUTG, UPNJ)

NODE=M042215;NODE=M042

DESIG=1
DESIG=2;OUR EST;→ UNCHECKED ←
DESIG=3;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=5;OUR EST;→ UNCHECKED ←
DESIG=6

NODE=M042220

NODE=M042R1
NODE=M042R1

NODE=M042R1;LINKAGE=A

NODE=M042R2
NODE=M042R2

NODE=M042R2;LINKAGE=A

NODE=M042R3
NODE=M042R3

NODE=M042R3;LINKAGE=A

NODE=M042R04
NODE=M042R04

NODE=M042

REFID=53525
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REFID=21838
REFID=21837
REFID=21733
REFID=21850
REFID=21830
REFID=21813

$\rho(2150)$ $I^G(J^{PC}) = 1^+(1^{--})$

OMITTED FROM SUMMARY TABLE

This entry was previously called $T_1(2190)$. See our mini-review under the $\rho(1700)$.

 $\rho(2150)$ MASS **e^+e^- PRODUCED**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2254±22	¹ LEES	12G BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
2150±40±50	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow f_1(1285)\pi^+\pi^-\gamma$
1990±80	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \eta'\pi^+\pi^-\gamma$
2153±37	BIAGINI	91 RVUE	$e^+e^- \rightarrow \pi^+\pi^-, K^+K^-$
2110±50	² CLEGG	90 RVUE	$e^+e^- \rightarrow 3(\pi^+\pi^-), 2(\pi^+\pi^-\pi^0)$

NODE=M032

NODE=M032205

NODE=M032M3

NODE=M032M3

OCCUR=2

NODE=M032M1

NODE=M032M1

 $\bar{p}p \rightarrow \pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~2191	HASAN	94 RVUE	$\bar{p}p \rightarrow \pi\pi$
~2070	³ OAKDEN	94 RVUE	0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~2170	⁴ MARTIN	80B RVUE	
~2100	⁴ MARTIN	80C RVUE	

NODE=M032M1

NODE=M032M1

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2110±35	⁵ ANISOVICH	02 SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
~2190	⁶ CUTTS	78B CNTR	$0.97\text{--}3 \bar{p}p \rightarrow \bar{N}N$
2155±15	^{6,7} COUPLAND	77 CNTR	$0.7\text{--}2.4 \bar{p}p \rightarrow \bar{p}p$
2193± 2	^{6,8} ALSPECTOR	73 CNTR	$\bar{p}p$ S channel
2190±10	⁹ ABRAMS	70 CNTR	S channel $\bar{p}N$

NODE=M032M2

NODE=M032M2

 $\pi^-p \rightarrow \omega\pi^0n$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2155±21 OUR AVERAGE			
2140±30	ALDE	95 GAM2	$38 \pi^-p \rightarrow \omega\pi^0n$
2170±30	ALDE	92C GAM4	$100 \pi^-p \rightarrow \omega\pi^0n$

NODE=M032M4

NODE=M032M4

1 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.

2 Includes ATKINSON 85.

3 See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.

4 $I(J^P) = 1(1^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.

5 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

6 Isospins 0 and 1 not separated.

7 From a fit to the total elastic cross section.

8 Referred to as T or T region by ALSPECTOR 73.

9 Seen as bump in $I = 1$ state. See also COOPER 68. PEASLEE 75 confirm $\bar{p}p$ results of ABRAMS 70, no narrow structure.

NODE=M032M3;LINKAGE=LE

NODE=M032M3;LINKAGE=A

NODE=M032M1;LINKAGE=CC

NODE=M032M;LINKAGE=P

NODE=M032M;LINKAGE=AY

NODE=M032M;LINKAGE=I

NODE=M032M;LINKAGE=E

NODE=M032M;LINKAGE=M

NODE=M032M;LINKAGE=B

 $\rho(2150)$ WIDTH **e^+e^- PRODUCED**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
109± 76	¹⁰ LEES	12G BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
350± 40±50	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow f_1(1285)\pi^+\pi^-\gamma$
310±140	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \eta'\pi^+\pi^-\gamma$
389± 79	BIAGINI	91 RVUE	$e^+e^- \rightarrow \pi^+\pi^-, K^+K^-$
410±100	¹¹ CLEGG	90 RVUE	$e^+e^- \rightarrow 3(\pi^+\pi^-), 2(\pi^+\pi^-\pi^0)$

NODE=M032210

NODE=M032W3

NODE=M032W3

OCCUR=2

$\bar{p}p \rightarrow \pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~ 296	HASAN	94	RVUE $\bar{p}p \rightarrow \pi\pi$
~ 40	12 OAKDEN	94	RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~ 250	13 MARTIN	80B	RVUE
~ 200	13 MARTIN	80C	RVUE

NODE=M032W1

NODE=M032W1

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
230±50	14 ANISOVICH	02	SPEC 0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
135±75	15,16 COUPLAND	77	CNTR 0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
98±8	16 ALSPECTOR	73	CNTR $\bar{p}p$ S channel
~ 85	17 ABRAMS	70	CNTR S channel $\bar{p}N$

NODE=M032W2

NODE=M032W2

 $\pi^- p \rightarrow \omega\pi^0 n$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
320±70	ALDE	95	GAM2 38 $\pi^- p \rightarrow \omega\pi^0 n$
• • • We do not use the following data for averages, fits, limits, etc. • • •			

NODE=M032W4

NODE=M032W4

- • • We do not use the following data for averages, fits, limits, etc. • • •
- ~ 300 ALDE 92C GAM4 100 $\pi^- p \rightarrow \omega\pi^0 n$
 - 10 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.
 - 11 Includes ATKINSON 85.
 - 12 See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.
 - 13 $I(JP) = 1(1^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.
 - 14 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.
 - 15 From a fit to the total elastic cross section.
 - 16 Isospins 0 and 1 not separated.
 - 17 Seen as bump in $I = 1$ state. See also COOPER 68. PEASLEE 75 confirm $\bar{p}p$ results of ABRAMS 70, no narrow structure.

NODE=M032W3;LINKAGE=LE

NODE=M032W3;LINKAGE=A
NODE=M032W1;LINKAGE=CCNODE=M032W;LINKAGE=P
NODE=M032W;LINKAGE=AYNODE=M032W;LINKAGE=E
NODE=M032W;LINKAGE=I
NODE=M032W;LINKAGE=B

NODE=M032215;NODE=M032

 $\rho(2150)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	
$\Gamma_2 \pi^+ \pi^-$	seen
$\Gamma_3 K^+ K^-$	seen
$\Gamma_4 3(\pi^+ \pi^-)$	seen
$\Gamma_5 2(\pi^+ \pi^- \pi^0)$	seen
$\Gamma_6 \eta' \pi^+ \pi^-$	seen
$\Gamma_7 f_1(1285)\pi^+ \pi^-$	seen
$\Gamma_8 \omega \pi^0$	seen
$\Gamma_9 \omega \pi^0 \eta$	seen
$\Gamma_{10} p\bar{p}$	

DESIG=1

DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=4;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=5;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=6;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=7;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=8;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=9;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=10

NODE=M032230

NODE=M032G01
NODE=M032G01

NODE=M032G01;LINKAGE=AU

NODE=M032G02
NODE=M032G02

NODE=M032G02;LINKAGE=AU

 $\rho(2150) \Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT
3.1±0.6±0.5	18 AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow f_1(1285)\pi^+ \pi^- \gamma$

18 Calculated by us from the reported value of cross section at the peak.

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			

4.9±1.9 19 AUBERT 07AU BABR $10.6 e^+ e^- \rightarrow \eta' \pi^+ \pi^- \gamma$

19 Calculated by us from the reported value of cross section at the peak.

$\rho(2150)$ REFERENCES

LEES	12G	PR D86 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)
ANISOVICH	02	PL B542 8	A.V. Anisovich <i>et al.</i>	
ANISOVICH	01D	PL B508 6	A.V. Anisovich <i>et al.</i>	
ANISOVICH	01E	PL B513 281	A.V. Anisovich <i>et al.</i>	
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
KLOET	96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)
ALDE	95	ZPHY C66 379	D.M. Alde <i>et al.</i>	(GAMS Collab.) JP
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)
OAKDEN	94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)
ALDE	92C	ZPHY C54 553	D.M. Alde <i>et al.</i>	(BELG, SERP, KEK, LANL+)
BIAGINI	91	NC 104A 363	M.E. Biagini <i>et al.</i>	(FRAS, PRAG)
CLEGG	90	ZPHY C45 677	A.B. Clegg, A. Donnachie	(LANC, MCHS)
ATKINSON	85	ZPHY C29 333	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
MARTIN	80B	NP B176 355	B.R. Martin, D. Morgan	(LOUC, RHEL) JP
MARTIN	80C	NP B169 216	A.D. Martin, M.R. Pennington	(DURH) JP
CUTTS	78B	PR D17 16	D. Cutts <i>et al.</i>	(STON, WISC)
COUPLAND	77	PL 71B 460	M. Coupland <i>et al.</i>	(LOQM, RHEL)
PEASLEE	75	PL 57B 189	D.C. Peaslee <i>et al.</i>	(CANB, BARI, BROW+)
ALSPECTOR	73	PRL 30 511	J. Alspector <i>et al.</i>	(RUTG, UPNJ)
ABRAMS	70	PR D1 1917	R.J. Abrams <i>et al.</i>	(BNL)
COOPER	68	PRL 20 1059	W.A. Cooper <i>et al.</i>	(ANL)
GOUNARIS	68	PRL 21 244	G.J. Gounaris, J.J. Sakurai	

NODE=M032

REFID=54299
 REFID=52049
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 REFID=45210
 REFID=41859
 REFID=41894
 REFID=41355
 REFID=22000
 REFID=21838
 REFID=21837
 REFID=21733
 REFID=21830
 REFID=21824
 REFID=21813
 REFID=21807
 REFID=21805
 REFID=48054

$\phi(2170)$

$$\rho^G(J^{PC}) = 0^-(1^{--})$$

Observed by AUBERT,BE 06D in the initial-state radiation process
 $e^+ e^- \rightarrow \phi f_0(980) \gamma$.

$\phi(2170)$ MASS

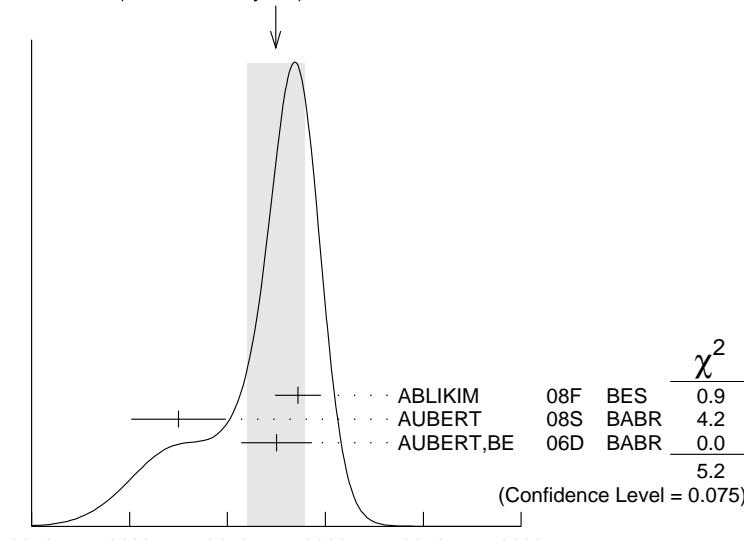
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2175±15 OUR AVERAGE				
2186±10± 6	52	ABLIKIM	08F BES	$J/\psi \rightarrow \eta \phi f_0(980)$
2125±22±10	483	AUBERT	08s BABR	$10.6 e^+ e^- \rightarrow \phi \eta \gamma$
2175±10±15	201	¹ AUBERT,BE 06D	BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi\pi\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$2079 \pm 13^{+79}_{-28}$	4.8k	² SHEN	09 BELL	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$
2192±14	116 ± 95	³ AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$
2169±20	149 ± 36	³ AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^0 \pi^0 \gamma$

1 From the $\phi f_0(980)$ component.

2 From a fit with two incoherent Breit-Wigners.

3 From the $K^+ K^- f_0(980)$ component.

WEIGHTED AVERAGE
 2175 ± 15 (Error scaled by 1.6)



NODE=M103

NODE=M103

NODE=M103M

NODE=M103M

OCCUR=2

NODE=M103M;LINKAGE=AB

NODE=M103M;LINKAGE=SH

NODE=M103M;LINKAGE=AU

$\phi(2170)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
61±18 OUR AVERAGE				
65±23±17	52	ABLIKIM	08F BES	$J/\psi \rightarrow \eta \phi f_0(980)$
61±50±13	483	AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi \eta \gamma$
58±16±20	201	AUBERT,BE	06D BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi\pi\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
192±23 ⁺²⁵ ₋₆₁	4.8k	⁵ SHEN	09 BELL	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$
71±21	116 ± 95	⁶ AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$
102±27	149 ± 36	⁶ AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^0 \pi^0 \gamma$
⁴ From the $\phi f_0(980)$ component.				
⁵ From a fit with two incoherent Breit-Wigners.				
⁶ From the $K^+ K^- f_0(980)$ component.				

NODE=M103W

NODE=M103W

OCCUR=2

NODE=M103W;LINKAGE=AB

NODE=M103W;LINKAGE=SH

NODE=M103W;LINKAGE=AU

$\phi(2170)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	seen
$\Gamma_2 \phi\eta$	
$\Gamma_3 \phi\pi\pi$	
$\Gamma_4 \phi f_0(980)$	seen
$\Gamma_5 K^+ K^- \pi^+ \pi^-$	
$\Gamma_6 K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^+ \pi^-$	seen
$\Gamma_7 K^+ K^- \pi^0 \pi^0$	
$\Gamma_8 K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^0 \pi^0$	seen
$\Gamma_9 K^{*0} K^\pm \pi^\mp$	not seen
$\Gamma_{10} K^*(892)^0 \bar{K}^*(892)^0$	not seen

NODE=M103215;NODE=M103

DESIG=1;OUR EVAL; \rightarrow UNCHECKED
 DESIG=5
 DESIG=9
 DESIG=2;OUR EVAL; \rightarrow UNCHECKED
 DESIG=3
 DESIG=6
 DESIG=4
 DESIG=7
 DESIG=8
 DESIG=10

$\phi(2170) \Gamma(i) \Gamma(e^+ e^-)/\Gamma(\text{total})$

$\Gamma(\phi\eta) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$	$\Gamma_2 \Gamma_1/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.7±0.7±1.3	483	AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow \phi \eta \gamma$

NODE=M103230

NODE=M103G2
NODE=M103G2

$\Gamma(\phi f_0(980)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$	$\Gamma_4 \Gamma_1/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
⁷ From the $\phi f_0(980)$ component.				
2.5±0.8±0.4	201	AUBERT,BE	06D BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi\pi\gamma$

NODE=M103G1
NODE=M103G1

NODE=M103G1;LINKAGE=AB

$\phi(2170) \Gamma(i) \Gamma(e^+ e^-)/\Gamma^2(\text{total})$

$\Gamma(\phi\pi\pi)/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$	$\Gamma_3/\Gamma \times \Gamma_1/\Gamma$			
VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.65±0.15±0.18	4.8k	⁸ SHEN	09 BELL	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$

NODE=M103220

NODE=M103G01
NODE=M103G01

$\Gamma(K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$	Γ_6/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
seen				
seen	AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$	

NODE=M103G01;LINKAGE=SH

NODE=M103225

NODE=M103R01
NODE=M103R01

$\Gamma(K^+ K^- f_0(980) \rightarrow K^+ K^- \pi^0 \pi^0)/\Gamma_{\text{total}}$	Γ_8/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
seen				
seen	AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^0 \pi^0 \gamma$	

NODE=M103R02
NODE=M103R02

$\Gamma(K^{*0} K^\pm \pi^\mp)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_9/Γ
not seen	AUBERT	07AK BABR	10.6 GeV $e^+ e^-$	

 $\Gamma(K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{10}/Γ
not seen	ABLIKIM	10C BES2	$J/\psi \rightarrow \eta K^+ \pi^- K^- \pi^+$	

 $\phi(2170)$ REFERENCES

ABLIKIM	10C	PL B685 27	M. Ablikim <i>et al.</i>	(BES II Collab.)
SHEN	09	PR D80 031101	C.P. Shen <i>et al.</i>	(BELLE Collab.)
ABLIKIM	08F	PRL 100 102003	M. Ablikim <i>et al.</i>	(BES Collab.)
AUBERT	08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,BE	06D	PR D74 091103	B. Aubert <i>et al.</i>	(BABAR Collab.)

 $f_0(2200)$ $I^G(J^{PC}) = 0^+(0^{++})$

OMMITTED FROM SUMMARY TABLE

Seen in $K_S^0 K_S^0$ (AUGUSTIN 88), $K^+ K^-$ (ABLIKIM 05Q) and $\eta\eta$ (BINON 05) system. Not seen in $\Upsilon(1S)$ radiative decays (BARU 89).

 $f_0(2200)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
2189±13 OUR AVERAGE				
2170±20 ⁺¹⁰ ₋₁₅	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$	
2210±50	¹ BINON	05 GAMS	$33 \pi^- p \rightarrow \eta \eta \eta$	
2197±17	² AUGUSTIN	88 DM2	$J/\psi \rightarrow \gamma K_S^0 K_S^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~2122	HASAN	94 RVUE	$\bar{p}p \rightarrow \pi\pi$	
~2321	HASAN	94 RVUE	$\bar{p}p \rightarrow \pi\pi$	

¹ First solution, PWA is ambiguous.² Cannot determine spin to be 0. $f_0(2200)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
238±50 OUR AVERAGE Error includes scale factor of 1.2.				
220±60 ⁺⁴⁰ ₋₄₅	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$	
380±90	³ BINON	05 GAMS	$33 \pi^- p \rightarrow \eta \eta \eta$	
201±51	⁴ AUGUSTIN	88 DM2	$J/\psi \rightarrow \gamma K_S^0 K_S^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~273	HASAN	94 RVUE	$\bar{p}p \rightarrow \pi\pi$	
~223	HASAN	94 RVUE	$\bar{p}p \rightarrow \pi\pi$	

³ First solution, PWA is ambiguous.⁴ Cannot determine spin to be 0. $f_0(2200)$ REFERENCES

ABLIKIM	05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
BINON	05	PAN 68 960	F. Binon <i>et al.</i>	
		Translated from YAF 68 998.		
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)
BARU	89	ZPHY C42 505	S.E. Baru <i>et al.</i>	(NOVO)
AUGUSTIN	88	PRL 60 2238	J.E. Augustin <i>et al.</i>	(DM2 Collab.)

NODE=M103R03
NODE=M103R03NODE=M103R04
NODE=M103R04

NODE=M103

REFID=53349
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REFID=52154
REFID=52242
REFID=51908
REFID=51511

NODE=M112

NODE=M112

NODE=M112M

NODE=M112M

OCCUR=2

NODE=M112M;LINKAGE=BI
NODE=M112M;LINKAGE=A

NODE=M112W

NODE=M112W

OCCUR=2

NODE=M112W;LINKAGE=BI
NODE=M112W;LINKAGE=A

NODE=M112

REFID=50958
REFID=50780
REFID=44103
REFID=40917
REFID=40574

$f_J(2220)$ $I^G(J^{PC}) = 0^+(2^{++} \text{ or } 4^{++})$

OMITTED FROM SUMMARY TABLE

Needs confirmation. See our mini-review in the 2004 edition of this
Review, PDG 04.

 $f_J(2220)$ MASS

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2231.1 ± 3.5 OUR AVERAGE					
2235	± 4	± 6	74	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$
2230	± 6	± 16	46	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma K^+ K^-$
2232	± 8	± 15	23	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma K_S^0 K_S^0$
2235	± 4	± 5	32	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma p\bar{p}$
2209	± 17	± 10		ASTON	88F LASS $11 K^- p \rightarrow K^+ K^- \Lambda$
2230	± 20			BOLONKIN	88 SPEC $40 \pi^- p \rightarrow K_S^0 K_S^0 n$
2220	± 10	41	¹ ALDE	86B GA24	$38\text{--}100 \pi p \rightarrow \eta\eta\eta'$
2230	± 6	± 14	93	BALTRUSAIT..86D	MRK3 $e^+ e^- \rightarrow \gamma K^+ K^-$
2232	± 7	± 7	23	BALTRUSAIT..86D	MRK3 $e^+ e^- \rightarrow \gamma K_S^0 K_S^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2223.9	± 2.5		² VLADIMIRSK..08	SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n + m\pi^0$
2246	± 36		BAI	98H BES	$J/\psi \rightarrow \gamma\pi^0\pi^0$
¹ ALDE 86B uses data from both the GAMS-2000 and GAMS-4000 detectors. ² $J^{PC} = 2^{++}$. Systematic uncertainties not evaluated					

 $f_J(2220)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
23 ± 8 OUR AVERAGE					
19	± 13	± 12	74	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$
20	± 20	± 17	46	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma K^+ K^-$
20	± 25	± 14	23	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma K_S^0 K_S^0$
15	± 12	± 9	32	BAI	96B BES $e^+ e^- \rightarrow J/\psi \rightarrow \gamma p\bar{p}$
60	± 107		ASTON	88F LASS	$11 K^- p \rightarrow K^+ K^- \Lambda$
80	± 30		BOLONKIN	88 SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n$
26	± 20	± 17	93	BALTRUSAIT..86D	MRK3 $e^+ e^- \rightarrow \gamma K^+ K^-$
18	± 23	± 10	23	BALTRUSAIT..86D	MRK3 $e^+ e^- \rightarrow \gamma K_S^0 K_S^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
8.6	± 2.5		³ VLADIMIRSK..08	SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n + m\pi^0$
<80		90	ALDE	87C GAM2	$38 \pi^- p \rightarrow \eta'\eta n$
³ $J^{PC} = 2^{++}$. Systematic uncertainties not evaluated					

 $f_J(2220)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	seen
$\Gamma_2 \pi^+ \pi^-$	seen
$\Gamma_3 K\bar{K}$	seen
$\Gamma_4 p\bar{p}$	
$\Gamma_5 \gamma\gamma$	not seen
$\Gamma_6 \eta\eta'(958)$	seen
$\Gamma_7 \phi\phi$	not seen
$\Gamma_8 \eta\eta$	not seen

NODE=M082

NODE=M082

NODE=M082M

NODE=M082M

OCCUR=2

OCCUR=3

OCCUR=4

OCCUR=2

NODE=M082M;LINKAGE=A
NODE=M082M;LINKAGE=VL

NODE=M082W

NODE=M082W

OCCUR=2

OCCUR=3

OCCUR=4

OCCUR=2

NODE=M082W;LINKAGE=VL

NODE=M082215;NODE=M082

DESIG=5;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=6;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=4
 DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=7;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=8;OUR EST; \rightarrow UNCHECKED \leftarrow

$f_J(2220) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_3\Gamma_5/\Gamma$
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	
< 1.4	95	⁴ ACCIARRI	01H L3	$\gamma\gamma \rightarrow K_S^0 K_S^0, E_{\text{cm}} = 91, 183-209 \text{ GeV}$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 5.6	95	⁴ GODANG	97	CLE2	$\gamma\gamma \rightarrow K_S^0 K_S^0$
< 86	95	⁴ ALBRECHT	90G ARG		$\gamma\gamma \rightarrow K^+ K^-$
<1000	95	⁵ ALTHOFF	85B TASS		$\gamma\gamma, K\bar{K}\pi$

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_1\Gamma_5/\Gamma$
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	
<2.5	95	ALAM	98C	CLE2	$\gamma\gamma \rightarrow \pi^+ \pi^-$

⁴ Assuming $J^P = 2^+$.

⁵ True for $J^P = 0^+$ and $J^P = 2^+$.

 $f_J(2220) \Gamma(i)\Gamma(p\bar{p})/\Gamma^2(\text{total})$

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\pi\pi)/\Gamma_{\text{total}}$					$\Gamma_4/\Gamma \times \Gamma_1/\Gamma$
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<18	95	⁶ AMSLER	01	CBAR	$1.4-1.5 \text{ p}\bar{p} \rightarrow \pi^0 \pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<(11-42)	99	⁷ HASAN	96	SPEC	$1.35-1.55 \text{ p}\bar{p} \rightarrow \pi^+ \pi^-$
----------	----	--------------------	----	------	--

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\phi\phi)/\Gamma_{\text{total}}$					$\Gamma_4/\Gamma \times \Gamma_7/\Gamma$
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<6	95	⁸ EVANGELIS...	98	SPEC	$1.1-2.0 \text{ p}\bar{p} \rightarrow \phi\phi$

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\eta\eta)/\Gamma_{\text{total}}$					$\Gamma_4/\Gamma \times \Gamma_8/\Gamma$
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<4	95	⁶ AMSLER	01	CBAR	$1.4-1.5 \text{ p}\bar{p} \rightarrow \eta\eta$

⁶ For $J^P = 2^+$ in the mass range 2222–2240 MeV and the total width between 10 and 20 MeV.

⁷ For $J^P = 2^+$ and $J^P = 4^+$ in the mass range 2220–2245 MeV and the total width of 15 MeV.

⁸ For $J^P = 2^+$, the mass of 2235 MeV and the total width of 15 MeV.

 $f_J(2220) \text{ BRANCHING RATIOS}$

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					

not seen		⁹ AUBERT	07AV BABR	$B \rightarrow p\bar{p} K(*)$	
not seen		WANG	05A BELL	$B^+ \rightarrow \bar{p}p K^+$	
<3.0	95	¹⁰ EVANGELIS...	97	SPEC	$1.96-2.40 \text{ p}\bar{p} \rightarrow K_S^0 K_S^0$
<1.1	99.7	¹¹ BARNES	93	SPEC	$1.3-1.57 \text{ p}\bar{p} \rightarrow K_S^0 K_S^0$
<2.6	99.7	¹¹ BARDIN	87	CNTR	$1.3-1.5 \text{ p}\bar{p} \rightarrow K^+ K^-$
<3.6	99.7	¹¹ SCULLI	87	CNTR	$1.29-1.55 \text{ p}\bar{p} \rightarrow K^+ K^-$

⁹ Assuming $\Gamma < 30$ MeV.

¹⁰ Assuming $\Gamma \sim 20$ MeV, $J^P = 2^+$ and $B(f_J(2220) \rightarrow K\bar{K}) = 100\%$.

¹¹ Assuming $\Gamma = 30-35$ MeV, $J^P = 2^+$ and $B(f_J(2220) \rightarrow K\bar{K}) = 100\%$.

$\Gamma(\pi\pi)/\Gamma(K\bar{K})$					Γ_1/Γ_3
VALUE	DOCUMENT ID	TECN	COMMENT		
1.0±0.5	BAI	96B BES	$e^+ e^- \rightarrow J/\psi \rightarrow \gamma 2\pi, K\bar{K}$		

$\Gamma(p\bar{p})/\Gamma(K\bar{K})$					Γ_4/Γ_3
VALUE	DOCUMENT ID	TECN	COMMENT		
0.17±0.09	BAI	96B BES	$e^+ e^- \rightarrow J/\psi \rightarrow \gamma p\bar{p}, K\bar{K}$		

NODE=M082220

NODE=M082G1

NODE=M082G1

NODE=M082G3

NODE=M082G3

NODE=M082G1;LINKAGE=D

NODE=M082G1;LINKAGE=C

NODE=M082223

NODE=M082GG1

NODE=M082GG1

NODE=M082GG2

NODE=M082GG2

NODE=M082GG3

NODE=M082GG3

NODE=M082GG;LINKAGE=A

NODE=M082GG;LINKAGE=B

NODE=M082GG;LINKAGE=C

NODE=M082225

NODE=M082R1

NODE=M082R1

NODE=M082R1;LINKAGE=AU

NODE=M082R1;LINKAGE=C

NODE=M082R1;LINKAGE=B

NODE=M082R2

NODE=M082R2

NODE=M082R3

NODE=M082R3

$f_J(2220)$ REFERENCES

VLADIMIRSK...	08	PAN 71 2129 Translated from YAF 71	V.V. Vladimirska et al. 2166.	(ITEP)	NODE=M082
AUBERT	07AV	PR D76 092004	B. Aubert et al.	(BABAR Collab.)	REFID=52681
WANG	05A	PL B617 141	M.-Z. Wang et al.	(BELLE Collab.)	REFID=51990
PDG	04	PL B592 1	S. Eidelman et al.	(PDG Collab.)	REFID=50651
ACCIARRI	01H	PL B501 173	M. Acciari et al.	(L3 Collab.)	REFID=49653
AMSLER	01	PL B520 175	C. Amsler et al.	(Crystal Barrel Collab.)	REFID=48321
ALAM	98C	PRL 81 3328	M.S. Alam et al.	(CLEO Collab.)	REFID=48558
BAI	98H	PRL 81 1179	J.Z. Bai et al.	(BES Collab.)	REFID=46326
EVANGELIS...	98	PR D57 5370	C. Evangelista et al.	(JETSET Collab.)	REFID=46342
EVANGELIS...	97	PR D56 3803	C. Evangelista et al.	(LEAR Collab.)	REFID=46365
GODANG	97	PRL 79 3829	R. Godang et al.	(CLEO Collab.)	REFID=45687
BAI	96B	PRL 76 3502	J.Z. Bai et al.	(BES Collab.)	REFID=45760
HASAN	96	PL B388 376	A. Hasan, D.V. Bugg	(BRUN, LOQM)	REFID=44736
BARNES	93	PL B309 469	P.D. Barnes et al.	(PS185 Collab.)	REFID=45197
ALBRECHT	90G	ZPHY C48 183	H. Albrecht et al.	(ARGUS Collab.)	REFID=43601
ASTON	88F	PL B215 199	D. Aston et al.	(SLAC, NAGO, CINC, INUS) JP	REFID=41374
BOLONKIN	88	NP B309 426	B.V. Bolonkin et al.	(ITEP, SERP)	REFID=40585
ALDE	87C	SJNP 45 255	D. Alde et al.		REFID=40580
		Translated from YAF 45 405.			REFID=47474
BARDIN	87	PL B195 292	G. Bardin et al.	(SACL, FERR, CERN, PADO+)	REFID=40235
SCULLI	87	PRL 58 1715	J. Sculli et al.	(NYU, BNL)	REFID=40023
ALDE	86B	PL B177 120	D.M. Alde et al.	(SERP, BELG, LANL, LAPP)	REFID=21864
BALTRUSAIT...	86D	PRL 56 107	R.M. Baltrusaitis	(CIT, UCSC, ILL, SLAC+)	REFID=21865
ALTHOFF	85B	ZPHY C29 189	M. Althoff et al.	(TASSO Collab.)	REFID=21349

OTHER RELATED PAPERS

DEL-AMO-SA... 100 PRL 105 172001 P. del Amo Sanchez et al. (BABAR Collab.)

$\eta(2225)$

$$\eta^G(J^{PC}) = 0^+(0^- +)$$

OMMITTED FROM SUMMARY TABLE

Seen in $J/\psi \rightarrow \gamma\phi\phi$. Possibly seen in $B \rightarrow \phi\phi K$ by LEES 11A.

$\eta(2225)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2226±16 OUR AVERAGE					
2240 ^{+30 +30} -20 -20	196 ± 19	ABLIKIM	08I BES	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$	
2230±25±15		BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$	
2214±20±13		BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 2220		BISELLLO	86B DM2	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$	

$\eta(2225)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
185^{+ 70} - 40 OUR AVERAGE					
190± 30 ⁺⁶⁰ -40	196 ± 19	ABLIKIM	08I BES	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$	
150 ⁺³⁰⁰ - 60 ± 60		BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 80		BISELLLO	86B DM2	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$	

$\eta(2225)$ REFERENCES

LEES	11A	PR D84 012001	J.P. Lees et al.	(BABAR Collab.)	REFID=16595
ABLIKIM	08I	PL B662 330	M. Ablikim et al.	(BES Collab.)	REFID=52255
BAI	90B	PRL 65 1309	Z. Bai et al.	(Mark III Collab.)	REFID=41354
BISELLLO	86B	PL B179 294	D. Bisello et al.	(DM2 Collab.)	REFID=22101

$\rho_3(2250)$ $I^G(J^{PC}) = 1^+(3^- -)$

OMITTED FROM SUMMARY TABLE

Contains results mostly from formation experiments. For further production experiments see the Further States entry. See also $\rho(2150)$, $f_2(2150)$, $f_4(2300)$, $\rho_5(2350)$.

 $\rho_3(2250)$ MASS **$\bar{p}p \rightarrow \pi\pi$ or $K\bar{K}$**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 2232	HASAN	94	RVUE	$\bar{p}p \rightarrow \pi\pi$
~ 2090	¹ OAKDEN	94	RVUE	0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~ 2250	² MARTIN	80B	RVUE	
~ 2300	² MARTIN	80C	RVUE	
~ 2140	³ CARTER	78B	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow K^- K^+$
~ 2150	⁴ CARTER	77	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow \pi\pi$

¹ See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.

² $I(J^P) = 1(3^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.

³ $I = 0, 1$. $J^P = 3^-$ from Barrelet-zero analysis.

⁴ $I(J^P) = 1(3^-)$ from amplitude analysis.

NODE=M044

NODE=M044

NODE=M044205

NODE=M044M1

NODE=M044M1

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2260±20	⁵ ANISOVICH	02	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
~ 2190	⁶ CUTTS	78B	CNTR	0.97–3 $\bar{p}p \rightarrow \bar{N}N$
2155±15	^{6,7} COUPLAND	77	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
2193± 2	^{6,8} ALSPECTOR	73	CNTR	$\bar{p}p$ S channel
2190±10	⁹ ABRAMS	70	CNTR	S channel $\bar{p}N$

⁵ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

⁶ Isospins 0 and 1 not separated.

⁷ From a fit to the total elastic cross section.

⁸ Referred to as T or T' region by ALSPECTOR 73.

⁹ Seen as bump in $I = 1$ state. See also COOPER 68. PEASLEE 75 confirm $\bar{p}p$ results of ABRAMS 70, no narrow structure.

NODE=M044M1;LINKAGE=CC

NODE=M044M1;LINKAGE=P

NODE=M044M1;LINKAGE=K

NODE=M044M1;LINKAGE=J

NODE=M044M2

NODE=M044M2

 $\pi^- p \rightarrow \eta\pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2290±20±30	AMELIN	00 VES	37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

NODE=M044M;LINKAGE=AY

NODE=M044M2;LINKAGE=I

NODE=M044M2;LINKAGE=E

NODE=M044M2;LINKAGE=M

NODE=M044M2;LINKAGE=B

NODE=M044M3

NODE=M044M3

 $\rho_3(2250)$ WIDTH **$\bar{p}p \rightarrow \pi\pi$ or $K\bar{K}$**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 220	HASAN	94	RVUE	$\bar{p}p \rightarrow \pi\pi$
~ 60	¹⁰ OAKDEN	94	RVUE	0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~ 250	¹¹ MARTIN	80B	RVUE	
~ 200	¹¹ MARTIN	80C	RVUE	
~ 150	¹² CARTER	78B	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow K^- K^+$
~ 200	¹³ CARTER	77	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow \pi\pi$

¹⁰ See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.

¹¹ $I(J^P) = 1(3^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.

¹² $I = 0, 1$. $J^P = 3^-$ from Barrelet-zero analysis.

¹³ $I(J^P) = 1(3^-)$ from amplitude analysis.

NODE=M044210

NODE=M044W1

NODE=M044W1

NODE=M044W1;LINKAGE=CC

NODE=M044W1;LINKAGE=P

NODE=M044W1;LINKAGE=K

NODE=M044W1;LINKAGE=J

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
160±25	¹⁴ ANISOVICH	02	SPEC	$0.6-1.9 \bar{p}\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
135±75	^{15,16} COUPLAND	77	CNTR	$0.7-2.4 \bar{p}\bar{p} \rightarrow \bar{p}\bar{p}$
98±8	¹⁶ ALSPECTOR	73	CNTR	$\bar{p}\bar{p}$ S channel
~ 85	¹⁷ ABRAMS	70	CNTR	S channel $\bar{p}N$
14 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.				
15 From a fit to the total elastic cross section.				
16 Isospins 0 and 1 not separated.				
17 Seen as bump in $I = 1$ state. See also COOPER 68. PEASLEE 75 confirm $\bar{p}\bar{p}$ results of ABRAMS 70, no narrow structure.				

NODE=M044W2

NODE=M044W2

 $\pi^- p \rightarrow \eta\pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
230±50±80	AMELIN	00	VES 37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

NODE=M044W3

NODE=M044W3

 $\rho_3(2250)$ REFERENCES

ANISOVICH 02	PL B542 8	A.V. Anisovich <i>et al.</i>
ANISOVICH 01D	PL B508 6	A.V. Anisovich <i>et al.</i>
ANISOVICH 01E	PL B513 281	A.V. Anisovich <i>et al.</i>
AMELIN 00	NP A668 83	D. Amelin <i>et al.</i>
ANISOVICH 00J	PL B491 47	A.V. Anisovich <i>et al.</i>
KLOET 96	PR D53 6120	W.M. Kloet, F. Myhrer
HASAN 94	PL B334 215	A. Hasan, D.V. Bugg
OAKDEN 94	NP A574 731	M.N. Oakden, M.R. Pennington
MARTIN 80B	NP B176 355	B.R. Martin, D. Morgan
MARTIN 80C	NP B169 216	A.D. Martin, M.R. Pennington
CARTER 78B	NP B141 467	A.A. Carter
CUTTS 78B	PR D17 16	D. Cutts <i>et al.</i>
CARTER 77	PL 67B 117	A.A. Carter <i>et al.</i>
COUPLAND 77	PL 71B 460	M. Coupland <i>et al.</i>
PEASLEE 75	PL 57B 189	D.C. Peaslee <i>et al.</i>
ALSPECTOR 73	PRL 30 511	J. Alspector <i>et al.</i>
ABRAMS 70	PR D1 1917	R.J. Abrams <i>et al.</i>
COOPER 68	PRL 20 1059	W.A. Cooper <i>et al.</i>

NODE=M044

REFID=48828
 REFID=48327
 REFID=48349
 REFID=47432
 REFID=47950
 REFID=45212
 REFID=44103
 REFID=45210
 REFID=21838
 REFID=21837
 REFID=21964
 REFID=21733
 REFID=21963
 REFID=21830
 REFID=21824
 REFID=21813
 REFID=21807
 REFID=21805

 $f_2(2300)$

$$I^G(J^{PC}) = 0^+(2^{++})$$

 $f_2(2300)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2297±28	¹ ETKIN	88	MPS 22 $\pi^- p \rightarrow \phi\phi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2270±12	VLADIMIRSK...06	SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n$
2327± 9±6	ABE	04	BELL $10.6 e^+ e^- \rightarrow e^+ e^- K^+ K^-$
2231±10	BOOTH	86	OMEG 85 $\pi^- Be \rightarrow 2\phi Be$
2220^{+90}_{-20}	LINDENBAUM 84	RVUE	
2320±40	ETKIN	82	MPS 22 $\pi^- p \rightarrow 2\phi n$

NODE=M107M

NODE=M107M

¹ Includes data of ETKIN 85. The percentage of the resonance going into $\phi\phi 2^{++} S_2$, D_2 , and D_0 is 6^{+15}_{-5} , 25^{+18}_{-14} , and 69^{+16}_{-27} , respectively.

NODE=M107M;LINKAGE=C

 $f_2(2300)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
149±41	² ETKIN	88	MPS 22 $\pi^- p \rightarrow \phi\phi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
90±29	VLADIMIRSK...06	SPEC	$40 \pi^- p \rightarrow K_S^0 K_S^0 n$
275±36±20	ABE	04	BELL $10.6 e^+ e^- \rightarrow e^+ e^- K^+ K^-$
133±50	BOOTH	86	OMEG 85 $\pi^- Be \rightarrow 2\phi Be$
200±50	LINDENBAUM 84	RVUE	
220±70	ETKIN	82	MPS 22 $\pi^- p \rightarrow 2\phi n$

NODE=M107W

NODE=M107W

² Includes data of ETKIN 85.

NODE=M107W;LINKAGE=C

f₂(2300) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \phi\phi$	seen
$\Gamma_2 K\bar{K}$	seen
$\Gamma_3 \gamma\gamma$	seen

f₂(2300) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(K\bar{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_3/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
44 \pm 12	³ ABE	04	BELL $e^+ e^- \rightarrow e^+ e^- K^+ K^-$
3 Assuming spin 2.			

f₂(2300) REFERENCES

VLADIMIRSK... 06	PAN 69 493 Translated from YAF 69 515.	V.V. Vladimirsy <i>et al.</i>	(ITEP, Moscow)
ABE 04	EPJ C32 323	K. Abe <i>et al.</i>	(BELL Collab.)
ETKIN 88	PL B201 568	A. Etkin <i>et al.</i>	(BNL, CUNY)
BOOTH 86	NP B273 677	P.S.L. Booth <i>et al.</i>	(LIVP, GLAS, CERN)
ETKIN 85	PL 165B 217	A. Etkin <i>et al.</i>	(BNL, CUNY)
LINDENBAUM 84	CNPP 13 285	S.J. Lindenbaum	(CUNY)
ETKIN 82	PRL 49 1620	A. Etkin <i>et al.</i>	(BNL, CUNY)

f₄(2300)

$$I^G(J^{PC}) = 0^+(4^{++})$$

OMITTED FROM SUMMARY TABLE

This entry was previously called $U_0(2350)$. Contains results mostly from formation experiments. For further production experiments see the Further States entry. See also $\rho(2150)$, $f_2(2150)$, $\rho_3(2250)$, $\rho_5(2350)$.

f₄(2300) MASS **$\bar{p}p \rightarrow \pi\pi$ or $\bar{K}K$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
~ 2314	HASAN 94	RVUE	$\bar{p}p \rightarrow \pi\pi$
~ 2300	¹ MARTIN 80B	RVUE	
~ 2300	¹ MARTIN 80C	RVUE	
~ 2340	² CARTER 78B	CNTR	$0.7\text{--}2.4 \bar{p}p \rightarrow K^- K^+$
~ 2330	DULUDE 78B	OSPK	$1\text{--}2 \bar{p}p \rightarrow \pi^0 \pi^0$
~ 2310	³ CARTER 77	CNTR	$0.7\text{--}2.4 \bar{p}p \rightarrow \pi\pi$
1 $I(J^P) = 0(4^+)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.			
2 $I(J^P) = 0(4^+)$ from Barrelet-zero analysis.			
3 $I(J^P) = 0(4^+)$ from amplitude analysis.			

S-CHANNEL $\bar{p}p$ or $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$			
2283 \pm 17	⁴ ANISOVICH 00J	SPEC	
~ 2380	⁵ CUTTS 78B	CNTR	$0.97\text{--}3 \bar{p}p \rightarrow \bar{N}N$
2345 \pm 15	^{5,6} COUPLAND 77	CNTR	$0.7\text{--}2.4 \bar{p}p \rightarrow \bar{p}p$
2359 \pm 2	^{5,7} ALSPECTOR 73	CNTR	$\bar{p}p$ S channel
2375 \pm 10	ABRAMS 70	CNTR	$\bar{p}p$ S channel $\bar{N}N$
⁴ From the combined analysis of ANISOVICH 99C and ANISOVICH 99F on $\bar{p}p \rightarrow \eta\pi^0\pi^0$, $\pi^0\pi^0$, $\eta\eta$, $\eta\eta'$, $\pi^+\pi^-$.			
⁵ Isospins 0 and 1 not separated.			
⁶ From a fit to the total elastic cross section.			
⁷ Referred to as U or U region by ALSPECTOR 73.			

NODE=M107215;NODE=M107

DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M107225

NODE=M107G1
NODE=M107G1

NODE=M107G1;LINKAGE=AB

NODE=M107

REFID=51191
REFID=49650
REFID=40285
REFID=21870
REFID=21871
REFID=21869
REFID=21866

NODE=M041

NODE=M041

NODE=M041205

NODE=M041M

NODE=M041M1
NODE=M041M1NODE=M041M1;LINKAGE=P
NODE=M041M1;LINKAGE=K
NODE=M041M1;LINKAGE=JNODE=M041M2
NODE=M041M2

NODE=M041M2;LINKAGE=AN

NODE=M041M2;LINKAGE=I
NODE=M041M2;LINKAGE=E
NODE=M041M2;LINKAGE=M

$\pi^- p \rightarrow \eta\pi\pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2330±20±40	AMELIN	00	VES 37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$
pp CENTRAL PRODUCTION			
2320±60 OUR ESTIMATE	DOCUMENT ID	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2332±15	BARBERIS	00F	450 $pp \rightarrow p_f \omega\omega p_s$

NODE=M041M3
NODE=M041M3 $\bar{p}p \rightarrow \pi\pi$ or $\bar{K}K$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~278	HASAN	94	RVUE $\bar{p}p \rightarrow \pi\pi$
~200	8 MARTIN	80C	RVUE
~150	9 CARTER	78B	CNTR 0.7–2.4 $\bar{p}p \rightarrow K^- K^+$
~210	10 CARTER	77	CNTR 0.7–2.4 $\bar{p}p \rightarrow \pi\pi$
8 $I(J^P)$ = 0(4^+) from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.			
9 $I(J^P)$ = 0(4^+) from Barrelet-zero analysis.			
10 $I(J^P)$ = 0(4^+) from amplitude analysis.			

NODE=M041M4
NODE=M041M4
→ UNCHECKED ← $f_4(2300)$ WIDTH $S\text{-CHANNEL } \bar{p}p \text{ or } \bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
310±25	11 ANISOVICH	00J	SPEC
135 ⁺¹⁵⁰ ₋₆₅	12,13 COUPLAND	77	CNTR 0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
165 ⁺¹⁸ ₋₈	13 ALSPECTOR	73	CNTR $\bar{p}p$ S channel
~190	ABRAMS	70	CNTR S channel $\bar{N}N$
11 From the combined analysis of ANISOVICH 99C and ANISOVICH 99F on $\bar{p}p \rightarrow \eta\pi^0\pi^0$, $\pi^0\pi^0$, $\eta\eta$, $\eta\eta'$, $\pi^+\pi^-$.			
12 From a fit to the total elastic cross section.			
13 Isospins 0 and 1 not separated.			

NODE=M041210
NODE=M041W1
NODE=M041W1 $\pi^- p \rightarrow \eta\pi\pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
235±50±40	AMELIN	00	VES 37 $\pi^- p \rightarrow \eta\pi^+\pi^- n$
pp CENTRAL PRODUCTION			
250±80 OUR ESTIMATE	DOCUMENT ID	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
260±57	BARBERIS	00F	450 $pp \rightarrow p_f \omega\omega p_s$

NODE=M041W1;LINKAGE=P
NODE=M041W1;LINKAGE=K
NODE=M041W1;LINKAGE=J $f_4(2300)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $\rho\rho$	seen
Γ_2 $\omega\omega$	seen
Γ_3 $\eta\pi\pi$	seen
Γ_4 $\pi\pi$	seen
Γ_5 $K\bar{K}$	seen
Γ_6 $N\bar{N}$	seen

NODE=M041W2;LINKAGE=AN

NODE=M041W2;LINKAGE=E
NODE=M041W2;LINKAGE=INODE=M041W3
NODE=M041W3NODE=M041W4
NODE=M041W4
→ UNCHECKED ←

NODE=M041215;NODE=M041

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=2;OUR EST;→ UNCHECKED ←
DESIG=3;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←
DESIG=5;OUR EST;→ UNCHECKED ←
DESIG=6;OUR EST;→ UNCHECKED ←

NODE=M041220

NODE=M041R1
NODE=M041R1 $f_4(2300)$ BRANCHING RATIOS

$\Gamma(\rho\rho)/\Gamma(\omega\omega)$	DOCUMENT ID	COMMENT	Γ_1/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2.8±0.5	BARBERIS	00F	450 $pp \rightarrow p_f \omega\omega p_s$

f₄(2300) REFERENCES

AMELIN	00	NP A668 83	D. Amelin <i>et al.</i>	(VES Collab.)
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
BARBERIS	00F	PL B484 198	D. Barberis <i>et al.</i>	(WA 102 Collab.)
ANISOVICH	99C	PL B452 173	A.V. Anisovich <i>et al.</i>	
ANISOVICH	99F	NP A651 253	A.V. Anisovich <i>et al.</i>	
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)
MARTIN	80B	NP B176 355	B.R. Martin, D. Morgan	(LOUC, RHEL) JP
MARTIN	80C	NP B169 216	A.D. Martin, M.R. Pennington	(DURH) JP
CARTER	78B	NP B141 467	A.A. Carter	(LOQM)
CUTTS	78B	PR D17 16	D. Cutts <i>et al.</i>	(STON, WISC)
DULUDE	78B	PL 79B 335	R.S. Dulude <i>et al.</i>	(BROW, MIT, BARIN) JP
CARTER	77	PL 67B 117	A.A. Carter <i>et al.</i>	(LOQM, RHEL) JP
COUPLAND	77	PL 71B 460	M. Coupland <i>et al.</i>	(LOQM, RHEL)
ALSPECTOR	73	PRL 30 511	J. Alspector <i>et al.</i>	(RUTG, UPNJ)
ABRAMS	70	PR D1 1917	R.J. Abrams <i>et al.</i>	(BNL)

NODE=M041

REFID=47432
REFID=47950
REFID=47962
REFID=46903
REFID=46926
REFID=44103
REFID=21838
REFID=21837
REFID=21964
REFID=21733
REFID=21850
REFID=21963
REFID=21830
REFID=21813
REFID=21807

f₀(2330)

$$I^G(J^{PC}) = 0^+(0^{++})$$

OMMITTED FROM SUMMARY TABLE

f₀(2330) MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2314±25	¹ BUGG	04A	RVUE
2337±14	ANISOVICH	00J	SPEC
~2321	HASAN	94	RVUE

¹ Partial wave analysis of the data on $p\bar{p} \rightarrow \Lambda\bar{\Lambda}$ from BARNES 00.

NODE=M169

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
144±20	² BUGG	04A	RVUE
217±33	ANISOVICH	00J	SPEC
~223	HASAN	94	RVUE

² Partial wave analysis of the data on $p\bar{p} \rightarrow \Lambda\bar{\Lambda}$ from BARNES 00.

NODE=M169M

NODE=M169M

NODE=M169M;LINKAGE=BU

NODE=M169W

NODE=M169W

NODE=M169W;LINKAGE=BU

NODE=M169

REFID=50158
REFID=47950
REFID=47965
REFID=44103

f₀(2330) REFERENCES

BUGG	04A	EPJ C36 161	D.V. Bugg	
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>	
BARNES	00	PR C62 055203	P.D. Barnes <i>et al.</i>	
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)

$f_2(2340)$ $I^G(J^{PC}) = 0^+(2^{++})$ **$f_2(2340)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2339±55		¹ ETKIN	88	MPS 22 $\pi^- p \rightarrow \phi\phi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2350± 7	80k	² UMAN	06	E835 5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
2392±10		BOOTH	86	OMEG 85 $\pi^- Be \rightarrow 2\phi Be$
2360±20		LINDENBAUM	84	RVUE

¹ Includes data of ETKIN 85. The percentage of the resonance going into $\phi\phi 2^{++} S_2$, D_2 , and D_0 is 37 ± 19 , 4_{-4}^{+12} , and 59_{-19}^{+21} , respectively.

² Statistical error only.

NODE=M108M

NODE=M108M

NODE=M108M;LINKAGE=C

NODE=M108M;LINKAGE=ST

NODE=M108W

NODE=M108W

NODE=M108W;LINKAGE=C
NODE=M108W;LINKAGE=ST

NODE=M108215;NODE=M108

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=2

NODE=M108220

NODE=M108R01
NODE=M108R01

NODE=M108

REFID=51063
REFID=40285
REFID=21870
REFID=21871
REFID=21869 **$f_2(2340)$ WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
319₋₆₉⁺⁸¹		³ ETKIN	88	MPS 22 $\pi^- p \rightarrow \phi\phi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
218± 16	80k	⁴ UMAN	06	E835 5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
198± 50		BOOTH	86	OMEG 85 $\pi^- Be \rightarrow 2\phi Be$
150 ₋₅₀ ⁺¹⁵⁰		LINDENBAUM	84	RVUE

³ Includes data of ETKIN 85.

⁴ Statistical error only.

 $f_2(2340)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \phi\phi$	seen
$\Gamma_2 \eta\eta$	seen

 $f_2(2340)$ BRANCHING RATIOS

$\Gamma(\eta\eta)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ_2/Γ
seen	UMAN 06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$

 $f_2(2340)$ REFERENCES

UMAN 06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)
ETKIN 88	PL B201 568	A. Etkin <i>et al.</i>	(BNL, CUNY)
BOOTH 86	NP B273 677	P.S.L. Booth <i>et al.</i>	(LIVP, GLAS, CERN)
ETKIN 85	PL 165B 217	A. Etkin <i>et al.</i>	(BNL, CUNY)
LINDENBAUM 84	CNPP 13 285	S.J. Lindenbaum	(CUNY)

NODE=M033

 $\rho_5(2350)$ $I^G(J^{PC}) = 1^+(5^{--})$

OMITTED FROM SUMMARY TABLE

This entry was previously called $U_1(2400)$. See also $\rho(2150)$,
 $f_2(2150)$, $\rho_3(2250)$, $f_4(2300)$.

 $\rho_5(2350)$ MASS $\pi^- p \rightarrow \omega\pi^0 n$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2330±35	ALDE 95	GAM2	38 $\pi^- p \rightarrow \omega\pi^0 n$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

~ 2303	HASAN	94	RVUE	$\bar{p}p \rightarrow \pi\pi$
~ 2300	¹ MARTIN	80B	RVUE	
~ 2250	¹ MARTIN	80C	RVUE	
~ 2500	² CARTER	78B	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow K^- K^+$
~ 2480	³ CARTER	77	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow \pi\pi$

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
-------------	-------------	------	-----	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

2300±45	⁴ ANISOVICH	02	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
2295±30	ANISOVICH	00J	SPEC	
~ 2380	⁵ CUTTS	78B	CNTR	0.97–3 $\bar{p}p \rightarrow \bar{N}N$
2345±15	^{5,6} COUPLAND	77	CNTR 0	0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
2359± 2	^{5,7} ALSPECTOR	73	CNTR	$\bar{p}p$ S channel
2350±10	⁸ ABRAMS	70	CNTR	S channel $\bar{N}N$
2360±25	⁹ OH	70B	HDBC –0	$\bar{p}(pn), K^* K 2\pi$

 $\pi^- p \rightarrow K^+ K^- n$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
-------------	-------------	------	-----	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

2307±6	ALPER	80	CNTR 0	62 $\pi^- p \rightarrow K^+ K^- n$
--------	-------	----	--------	------------------------------------

¹ $I(J^P) = 1(5^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.

² $I = 0(1); J^P = 5^-$ from Barrelet-zero analysis.

³ $I(J^P) = 1(5^-)$ from amplitude analysis.

⁴ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

⁵ Isospins 0 and 1 not separated.

⁶ From a fit to the total elastic cross section.

⁷ Referred to as U or U region by ALSPECTOR 73.

⁸ For $I = 1 \bar{N}N$.

⁹ No evidence for this bump seen in the $\bar{p}p$ data of CHAPMAN 71B. Narrow state not confirmed by OH 73 with more data.

NODE=M033M2
NODE=M033M2

 $\rho_5(2350)$ WIDTH $\pi^- p \rightarrow \omega\pi^0 n$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
400±100	ALDE 95	GAM2	38 $\pi^- p \rightarrow \omega\pi^0 n$

NODE=M033210

NODE=M033W3
NODE=M033W3

NODE=M033205

NODE=M033M

NODE=M033M3
NODE=M033M3

NODE=M033M1

NODE=M033M2
NODE=M033M2

NODE=M033M4
NODE=M033M4

NODE=M033M1;LINKAGE=P
NODE=M033M1;LINKAGE=K
NODE=M033M1;LINKAGE=J
NODE=M033M2;LINKAGE=AY

NODE=M033M2;LINKAGE=I
NODE=M033M2;LINKAGE=E
NODE=M033M2;LINKAGE=M
NODE=M033M2;LINKAGE=A
NODE=M033M2;LINKAGE=N

$\bar{p}p \rightarrow \pi\pi$ or $\bar{K}K$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 169	HASAN 94	RVUE		$\bar{p}p \rightarrow \pi\pi$
~ 250	10 MARTIN 80B	RVUE		
~ 300	10 MARTIN 80C	RVUE		
~ 150	11 CARTER 78B	CNTR 0		0.7–2.4 $\bar{p}p \rightarrow K^- K^+$
~ 210	12 CARTER 77	CNTR 0		0.7–2.4 $\bar{p}p \rightarrow \pi\pi$

NODE=M033W1

NODE=M033W1

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
260 ± 75	13 ANISOVICH 02	SPEC		0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
235 + 65 - 40	ANISOVICH 00J	SPEC		
135 + 150 - 65	14,15 COUPLAND 77	CNTR 0		0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
165 + 18 - 8	15 ALSPECTOR 73	CNTR		$\bar{p}p$ S channel
< 60	16 OH 70B	HDBC -0		$\bar{p}(pn), K^* K 2\pi$
~ 140	ABRAMS 67C	CNTR		S channel $\bar{p}N$

NODE=M033W2

NODE=M033W2

 $\pi^- p \rightarrow K^+ K^- n$

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
245 ± 20	ALPER 80	CNTR 0		62 $\pi^- p \rightarrow K^+ K^- n$
10 $I(J^P) = 1(5^-)$				from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.
11 $I = 0(1); J^P = 5^-$				from Barrelet-zero analysis.
12 $I(J^P) = 1(5^-)$				from amplitude analysis.
13 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.				
14 From a fit to the total elastic cross section.				
15 Isospins 0 and 1 not separated.				
16 No evidence for this bump seen in the $\bar{p}p$ data of CHAPMAN 71B. Narrow state not confirmed by OH 73 with more data.				

NODE=M033W4

NODE=M033W4

OCCUR=2

NODE=M033W1;LINKAGE=P
 NODE=M033W1;LINKAGE=K
 NODE=M033W1;LINKAGE=J
 NODE=M033W2;LINKAGE=AY

NODE=M033W2;LINKAGE=E
 NODE=M033W2;LINKAGE=I
 NODE=M033W2;LINKAGE=N

NODE=M033

REFID=48828
 REFID=48327
 REFID=48349
 REFID=47950
 REFID=44371
 REFID=44103
 REFID=21665
 REFID=21838
 REFID=21837
 REFID=21964
 REFID=21733
 REFID=21963
 REFID=21830
 REFID=21813
 REFID=21931
 REFID=21926
 REFID=21807
 REFID=21925
 REFID=21804

ANISOVICH	02	PL B542 8	A.V. Anisovich <i>et al.</i>
ANISOVICH	01D	PL B508 6	A.V. Anisovich <i>et al.</i>
ANISOVICH	01E	PL B513 281	A.V. Anisovich <i>et al.</i>
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>
ALDE	95	ZPHY C66 379	D.M. Alde <i>et al.</i>
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg
ALPER	80	PL 94B 422	B. Alper <i>et al.</i>
MARTIN	80B	NP B176 355	B.R. Martin, D. Morgan
MARTIN	80C	NP B169 216	A.D. Martin, M.R. Pennington
CARTER	78B	NP B141 467	A.A. Carter
CUTTS	78B	PR D17 16	D. Cutts <i>et al.</i>
CARTER	77	PL 67B 117	A.A. Carter <i>et al.</i>
COUPLAND	77	PL 71B 460	M. Coupland <i>et al.</i>
ALSPECTOR	73	PR D30 511	J. Alspector <i>et al.</i>
OH	73	NP B51 57	B.Y. Oh <i>et al.</i>
CHAPMAN	71B	PR D4 1275	J.W. Chapman <i>et al.</i>
ABRAMS	70	PR D1 1917	R.J. Abrams <i>et al.</i>
OH	70B	PRL 24 1257	B.Y. Oh <i>et al.</i>
ABRAMS	67C	PRL 18 1209	R.J. Abrams <i>et al.</i>

$a_6(2450)$

$$I^G(J^{PC}) = 1^-(6^{++})$$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

 $a_6(2450)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
2450±130	1 CLELAND	82B	SPEC	± 50 $\pi p \rightarrow K_S^0 K^\pm p$

¹ From an amplitude analysis. **$a_6(2450)$ WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
400±250	2 CLELAND	82B	SPEC	± 50 $\pi p \rightarrow K_S^0 K^\pm p$

² From an amplitude analysis. **$a_6(2450)$ DECAY MODES**

Mode
$\Gamma_1 K\bar{K}$

 $a_6(2450)$ REFERENCESCLELAND 82B NP B208 228 W.E. Cleland *et al.* (DURH, GEVA, LAUS+) **$f_6(2510)$**

$$I^G(J^{PC}) = 0^+(6^{++})$$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

 $f_6(2510)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2469±29 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.		
2485±40	1 ANISOVICH 00J	SPEC	1.92–2.41 $p\bar{p}$
2420±30	ALDE 98	GAM4	100 $\pi^- p \rightarrow \pi^0 \pi^0 n$
2510±30	BINON 84B	GAM2	38 $\pi^- p \rightarrow n2\pi^0$

¹ From the combined analysis of ANISOVICH 99C, ANISOVICH 99F, ANISOVICH 99J, ANISOVICH 99K, and ANISOVICH 00B.

NODE=M024

NODE=M024M

NODE=M024M

NODE=M024M;LINKAGE=C

NODE=M024W

NODE=M024W

NODE=M024W;LINKAGE=C

NODE=M024215;NODE=M024

DESIG=1

NODE=M024

REFID=21281

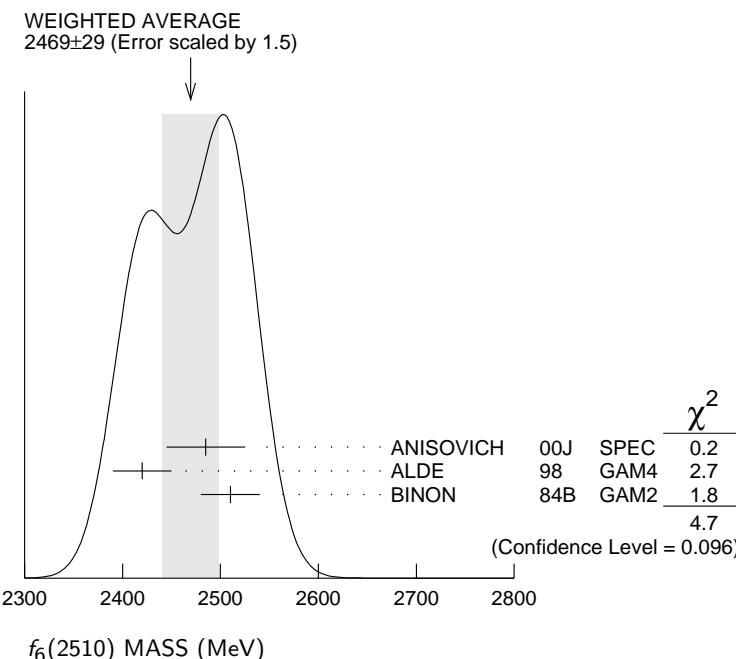
NODE=M089

NODE=M089

NODE=M089M

NODE=M089M

NODE=M089M;LINKAGE=AN



f₆(2510) WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
283±40 OUR AVERAGE	Error includes scale factor of 1.1.		
410±90	² ANISOVICH	00J	SPEC 1.92–2.41 $p\bar{p}$
270±60	ALDE	98	$100 \pi^- p \rightarrow \pi^0 \pi^0 n$
240±60	BINON	84B	$38 \pi^- p \rightarrow n 2\pi^0$

² From the combined analysis of ANISOVICH 99C, ANISOVICH 99F, ANISOVICH 99J, ANISOVICH 99K, and ANISOVICH 00B.

f₆(2510) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi\pi$	(6.0±1.0) %

f₆(2510) BRANCHING RATIOS

$\Gamma(\pi\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ_1/Γ
0.06±0.01	3 BINON	83C	GAM2 38 $\pi^- p \rightarrow n 4\gamma$

3 Assuming one pion exchange and using data of BOLOTOV 74.

f₆(2510) REFERENCES

ANISOVICH	00B	NP A662 319	A.V. Anisovich <i>et al.</i>
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>
ANISOVICH	99C	PL B452 173	A.V. Anisovich <i>et al.</i>
ANISOVICH	99F	NP A651 253	A.V. Anisovich <i>et al.</i>
ANISOVICH	99J	PL B471 271	A.V. Anisovich <i>et al.</i>
ANISOVICH	99K	PL B468 309	A.V. Anisovich <i>et al.</i>
ALDE	98	EPJ A3 361	D. Alde <i>et al.</i>
Also		PAN 62 405	D. Alde <i>et al.</i>
		Translated from YAF 62 446.	(GAM4 Collab.)
BINON	84B	LNC 39 41	F.G. Binon <i>et al.</i>
BINON	83C	SJNP 38 723	F.G. Binon <i>et al.</i>
BOLOTOV	74	PL 52B 489	V.N. Bolotov <i>et al.</i>
		Translated from YAF 38 1199.	(SERP)

NODE=M089W

NODE=M089W

NODE=M089W;LINKAGE=AN

NODE=M089215;NODE=M089

DESIG=1

NODE=M089220

NODE=M089R1
NODE=M089R1

NODE=M089R1;LINKAGE=A

NODE=M089

REFID=47942
REFID=47950
REFID=46903
REFID=46926
REFID=47416
REFID=47472
REFID=46605
REFID=46914
REFID=21780
REFID=40288
REFID=44705

OTHER LIGHT MESONS

Further States

OMITTED FROM SUMMARY TABLE

This section contains states observed by a single group or states poorly established that thus need confirmation.

QUANTUM NUMBERS, MASSES, WIDTHS, AND BRANCHING RATIOS

X(360)	$I^G(J^{PC}) = ?^?(?^+)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$360 \pm 7 \pm 9$	64 ± 18	2.3k	1 ABRAAMYAN 09	CNTR	$2.75 d C \rightarrow \gamma\gamma X$		

¹ Not seen in $pC \rightarrow \gamma\gamma X$ at 5.5 GeV/c.

NODE=MXXX015

X(1070)	$I^G(J^{PC}) = ?^?(0^++)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>
1072 ± 1	3.5 ± 0.5	2 VLADIMIRSK...08	$40 \pi^- p \rightarrow K_S^0 K_S^0 n + m\pi^0$		

² Supersedes GRIGOR'EV 05.

NODE=M300

NODE=M300

NODE=M300K08

NODE=M300K08

NODE=M300K08;LINKAGE=AB

X(1110)	$I^G(J^{PC}) = 0^+(even++)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1107 ± 4	$111 \pm 8 \pm 15$	DAFTARI	87	DBC	$0. \bar{p}n \rightarrow \rho^- \pi^+ \pi^-$	

NODE=M300J07

NODE=M300J07

NODE=M300J07;LINKAGE=VL

NODE=M300J30

NODE=M300J30

NODE=M300J98

NODE=M300J98

OCCUR=2

NODE=M300;LINKAGE=KM

NODE=M300;LINKAGE=MK

NODE=M300J61

NODE=M300J61

NODE=M300K07

NODE=M300K07

NODE=M300K07;LINKAGE=VL

NODE=M300J08

NODE=M300J08

X(1420)	$I^G(J^{PC}) = 2^+(0^++)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1420 ± 20	160 ± 10	FILIPPI	00	OBLX	$0 \bar{n}p \rightarrow \pi^+ \pi^+ \pi^-$	

X(1545)	$I^G(J^{PC}) = ?^?(?^++)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>
1545 ± 3	6.0 ± 2.5	5 VLADIMIRSK...08	$40 \pi^- p \rightarrow K_S^0 K_S^0 n + m\pi^0$		

⁵ Supersedes VLADIMIRSKII 00.

NODE=M300K07

NODE=M300K07

X(1575)	$I^G(J^{PC}) = ?^?(1^- -)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1576^{+49+98}_{-55-91}	$818^{+22+64}_{-23-133}$	6 ABLIKIM	06s	BES	$J/\psi \rightarrow K^+ K^- \pi^0$	

NODE=M300J08

NODE=M300J08

⁶A broad peak observed at $K^+ K^-$ invariant mass. Mass and width above are its pole position. The observed branching ratio is $B(J/\psi \rightarrow X\pi^0) B(X \rightarrow K^+ K^-) = (8.5 \pm 0.6^{+2.7}_{-3.6}) \times 10^{-4}$.

X(1600)	$I^G(J^{PC}) = 2^+(2^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1600 \pm 100	400 \pm 200	7 ALBRECHT	91F ARG	10.2 $e^+ e^- \rightarrow e^+ e^- 2(\pi^+ \pi^-)$
7 Our estimate.				

X(1650)	$I^G(J^{PC}) = 0^-(?^-)$				
MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1652 \pm 7	<50	100	PROKOSHKIN 96	GAM2	32,38 $\pi p \rightarrow \omega \eta n$

X(1730)	$I^G(J^{PC}) = ??(?^?)$				
MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1731.0 \pm 1.2 \pm 2.0	3.2 \pm 0.8 \pm 1.3	58	VLADIMIRSK..07	SPEC	40 $\pi^- p \rightarrow K_S^0 K_S^0 X$

X(1750)	$I^G(J^{PC}) = ??(1^{--})$				
MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1753.5 \pm 1.5 \pm 2.3					
1753.5 \pm 1.5 \pm 2.3	122.2 \pm 6.2 \pm 8.0	LINK	02K FOCS	20-160 $\gamma p \rightarrow K^+ K^- p$	
$B(X(1750) \rightarrow \bar{K}^*(892)^0 K^0 \rightarrow K^\pm \pi^\mp K_S^0)/B(X(1750) \rightarrow K^+ K^-)$					
VALUE	CL%	DOCUMENT ID	TECN		
<0.065	90	LINK	02K FOCS		
$B(X(1750) \rightarrow \bar{K}^*(892)^\pm K^\mp \rightarrow K^\pm \pi^\mp K_S^0)/B(X(1750) \rightarrow K^+ K^-)$					
VALUE	CL%	DOCUMENT ID	TECN		
<0.183	90	LINK	02K FOCS		

f₂(1750)	$I^G(J^{PC}) = 0^+(2^{++})$				
MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1755 \pm 10					
1755 \pm 10	67 \pm 12	870	8 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$
$\Gamma(K\bar{K})$					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
17 \pm 5	870	9 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$	
$\Gamma(\gamma\gamma)$					
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.13 \pm 0.04	870	9 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$	
$\Gamma(\pi\pi)$					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1.3 \pm 1.0	870	9 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$	
$\Gamma(\eta\eta)$					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2.0 \pm 0.5	870	9 SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$	

⁸From analysis of L3 data at 91 and 183–209 GeV.

⁹From analysis of L3 data at 91 and 183–209 GeV and using SU(3) relations.

X(1775)	$I^G(J^{PC}) = 1^-(?^-)$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1763 \pm 20	192 \pm 60	CONDO	91	SHF $\gamma p \rightarrow (p\pi^+)(\pi^+\pi^-\pi^-)$
1787 \pm 18	118 \pm 60	CONDO	91	SHF $\gamma p \rightarrow n\pi^+\pi^+\pi^-$

f₀(1800)	$I^G(J^{PC}) = 0^+(0^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1795 \pm 7 ⁺²³ ₋₂₀	95 \pm 10 ⁺⁷⁸ ₋₈₂	ABLIKIM	13J BES3	$J/\psi \rightarrow \gamma\omega\phi$
1812 \pm 19 ⁺¹⁹ ₋₂₆	105 \pm 20 \pm 28	10 ABLIKIM	06J BES2	$J/\psi \rightarrow \gamma\omega\phi$

NODE=M300J08;LINKAGE=AB

NODE=M300J99
NODE=M300J99

NODE=M300J99;LINKAGE=A

NODE=M300J62
NODE=M300J62

NODE=M300K06
NODE=M300K06

NODE=M300J94
NODE=M300J94

NODE=M300B5
NODE=M300B5

NODE=M300B6
NODE=M300B6

NODE=M300JAM
NODE=M300JAM

NODE=M300JA1
NODE=M300JA1

NODE=M300JA2
NODE=M300JA2

NODE=M300JA3
NODE=M300JA3

NODE=M300JA4
NODE=M300JA4

NODE=M300JAM;LINKAGE=SC
NODE=M300JA;LINKAGE=SC

NODE=M300J60
NODE=M300J60

OCCUR=2

NODE=M300K29
NODE=M300K29

10 Not seen by LIU 09 in $B^\pm \rightarrow K^\pm \omega \phi$.

X(1850 - 3100)	$I^G(JPC) = ?^?(1^- -)$			
$\Gamma(e^+ e^-) \cdot B(X \rightarrow \text{hadrons}) (\text{eV})$	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<120	90	11 ANASHIN	11 KEDR	$e^+ e^- \rightarrow \text{hadrons}$
11 This limit is center-of-mass energy dependent. We quote the most stringent one.				

NODE=M300K29;LINKAGE=AB

X(1855)	$I^G(JPC) = ?^?(???)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1856.6 ± 5	20 ± 5	BRIDGES	86D	SPEC 0. $\bar{p}d \rightarrow \pi\pi N$

NODE=M300J31
NODE=M300J31

X(1870)	$I^G(JPC) = ?^?(2??)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1870 ± 40	250 ± 30	ALDE	86D	GAM4 100 $\pi^- p \rightarrow 2\eta X$

NODE=M300J45
NODE=M300J45

a₃(1875)	$I^G(JPC) = 1^-(3++)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1874 ± 43 ± 96	385 ± 121 ± 114	CHUNG	02	B852 18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

NODE=M300J95
NODE=M300J95

B(a₃(1875) → f₂(1270)π)/B(a₃(1875) → ρπ)				
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.8 ± 0.2	12 CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

NODE=M300B7
NODE=M300B7

B(a₃(1875) → ρ₃(1690)π)/B(a₃(1875) → ρπ)				
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.9 ± 0.3	13 CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+ \pi^- \pi^- p$

NODE=M300B8;LINKAGE=C1

a₁(1930)	$I^G(JPC) = 1^-(1++)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1930 ⁺³⁰ ₋₇₀	155 ± 45	ANISOVICH	01F	SPEC 2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J92
NODE=M300J92

X(1935)	$I^G(JPC) = 1^+(1^-?)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1935 ± 20	215 ± 30	EVANGELIS...	79	OMEG 10,16 $\pi^- p \rightarrow \bar{p}pn$

NODE=M300J33
NODE=M300J33

ρ₂(1940)	$I^G(JPC) = 1^+(2--)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1940 ± 40	155 ± 40	14 ANISOVICH	02	SPEC 0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

NODE=M300J85
NODE=M300J85

14 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

NODE=M300J85;LINKAGE=AY

ω₃(1945)	$I^G(JPC) = 0^-(3--)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1945 ± 20	115 ± 22	15 ANISOVICH	02B	SPEC 0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

NODE=M300J65
NODE=M300J65

15 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

NODE=M300J65;LINKAGE=AZ

a₂(1950)	$I^G(JPC) = 1^-(2++)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1950 ⁺³⁰ ₋₇₀	180 ⁺³⁰ ₋₇₀	16 ANISOVICH	01F	SPEC 1.96–2.41 $\bar{p}p$

NODE=M300K24
NODE=M300K24

16 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

$\omega(1960)$	$I^G(J^{PC}) = 0^-(1^{--})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1960 \pm 25	195 \pm 60	17	ANISOVICH	02B	SPEC	$0.6\text{--}1.9 \ p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

17 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$b_1(1960)$	$I^G(J^{PC}) = 1^+(1^{+-})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1960 \pm 35	230 \pm 50	18	ANISOVICH	02	SPEC	$0.6\text{--}1.9 \ p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

18 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$h_1(1965)$	$I^G(J^{PC}) = 0^-(1^{+-})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1965 \pm 45	345 \pm 75	19	ANISOVICH	02B	SPEC	$0.6\text{--}1.9 \ p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

19 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$f_1(1970)$	$I^G(J^{PC}) = 0^+(1^{++})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1971 \pm 15	240 \pm 45			ANISOVICH	00J	SPEC

$X(1970)$	$I^G(J^{PC}) = ??(???)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1970 \pm 10	40 \pm 20			CHLIAPNIK...	80	HBC $32 \ K^+ p \rightarrow 2K_S^0 2\pi X$

$X(1975)$	$I^G(J^{PC}) = ??(???)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1973 \pm 15	80			30	CASO	70	HBC $11.2 \ \pi^- p \rightarrow \rho 2\pi$

$\omega_2(1975)$	$I^G(J^{PC}) = 0^-(2^{--})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1975 \pm 20	175 \pm 25	20	ANISOVICH	02B	SPEC	$0.6\text{--}1.9 \ p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

20 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$a_2(1990)$	$I^G(J^{PC}) = 1^-(2^{++})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2050 \pm 10 \pm 40	190 \pm 22 \pm 100	18k	21	SCHEGELSKY	06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
2003 \pm 10 \pm 19	249 \pm 23 \pm 32			LU	05	B852	$18 \ \pi^- p \rightarrow \omega\pi^-\pi^0 p$

21 From analysis of L3 data at 183–209 GeV.

$\Gamma(\gamma\gamma) \Gamma(\pi^+\pi^-\pi^0) / \Gamma(\text{total})$						
<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.11 \pm 0.04 \pm 0.05	18k	22 SCHEGELSKY	06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$	

22 From analysis of L3 data at 183–209 GeV.

$\rho(2000)$	$I^G(J^{PC}) = 1^+(1^{--})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2000 \pm 30	260 \pm 45	23 BUGG		04C	RVUE	Compilation
~ 1988	~ 244	HASAN		94	RVUE	$\bar{p}p \rightarrow \pi\pi$

NODE=M300K24;LINKAGE=AN

NODE=M300J79
NODE=M300J79

NODE=M300J67
NODE=M300J67

NODE=M300J67;LINKAGE=AY

NODE=M300J64
NODE=M300J64

NODE=M300J1
NODE=M300J1

NODE=M300J46
NODE=M300J46

NODE=M300J47
NODE=M300J47

NODE=M300J81
NODE=M300J81

NODE=M300J81;LINKAGE=AZ

NODE=M300J2
NODE=M300J2

NODE=M300J2;LINKAGE=SC

NODE=M300J2G
NODE=M300J2G

NODE=M300J2G;LINKAGE=SC

NODE=M300J77
NODE=M300J77

²³ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$f_2(2000)$	$I^G(JPC) = 0^+(2^{++})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2001 \pm 10	312 \pm 32	ANISOVICH 00J	SPEC		
\sim 1996	\sim 134	HASAN 94	RVUE	$\bar{p}p \rightarrow \pi\pi$	

NODE=M300;LINKAGE=AY

$X(2000)$	$I^G(JPC) = 1^-(?^+)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
1964 \pm 35	225 \pm 50	24 ARMSTRONG 93D	E760		$\bar{p}p \rightarrow 3\pi^0 \rightarrow 6\gamma$
\sim 2100	\sim 500	24 ANTIPOV 77	CIBS	-	$25\pi^- p \rightarrow p\pi^-\rho_3$
2214 \pm 15	355 \pm 21	25 BALTAY 77	HBC	0	$15\pi^- p \rightarrow \Delta^+ + 3\pi$
2080 \pm 40	340 \pm 80	KALELKAR 75	HBC	+	$15\pi^+ p \rightarrow p\pi^+\rho_3$

²⁴ Cannot determine spin to be 3.²⁵ BALTAY 77 favors $J^P = ,3^+$.NODE=M300J25
NODE=M300J25

$X(2000)$	$I^G(JPC) = ?(4^{++})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1998 \pm 3 \pm 5	<15	VLADIMIRSK..03	SPEC	$\pi^- p \rightarrow K_S^0 K_S^0 MM$	

NODE=M300K01
NODE=M300K01

$\pi_2(2005)$	$I^G(JPC) = 1^-(2^{-+})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1974 \pm 14 \pm 83	341 \pm 61 \pm 139	145k	LU 05	B852	$18\pi^- p \rightarrow \omega\pi^-\pi^0 p$
2005 \pm 15	200 \pm 40		ANISOVICH 01F	SPEC	$2.0\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J97
NODE=M300J97

$\eta(2010)$	$I^G(JPC) = 0^+(0^{-+})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>		
2010 $^{+35}_{-60}$	270 \pm 60	ANISOVICH 00J	SPEC		

NODE=M300J55
NODE=M300J55

$\pi_1(2015)$	$I^G(JPC) = 1^-(1^{-+})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2014 \pm 20 \pm 16	230 \pm 32 \pm 73	145k	LU 05	B852	$18\pi^- p \rightarrow \omega\pi^-\pi^0 p$
2001 \pm 30 \pm 92	333 \pm 52 \pm 49	69k	KUHN 04	B852	$18\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$

NODE=M300J05
NODE=M300J05

$a_0(2020)$	$I^G(JPC) = 1^-(0^{++})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>		
2025 \pm 30	330 \pm 75	ANISOVICH 99C	SPEC		

NODE=M300J6
NODE=M300J6

$X(2020)$	$I^G(JPC) = ??(???)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2015 \pm 3	10 \pm 4	FERRER 99	RVUE	$\pi p \rightarrow p p \bar{p} \pi(\pi)$	

NODE=M300J34
NODE=M300J34

$h_3(2025)$	$I^G(JPC) = 0^-(3^{+-})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2025 \pm 20	145 \pm 30	26 ANISOVICH 02B	SPEC	0.6-1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$	

²⁶ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

NODE=M300J78
NODE=M300J78

$b_3(2030)$	$I^G(JPC) = 1^+(3^{+-})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2032 \pm 12	117 \pm 11	27 ANISOVICH 02	SPEC	0.6-1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$	

NODE=M300J69
NODE=M300J69

$b_3(2030)$	$I^G(JPC) = 1^+(3^{+-})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2032 \pm 12	117 \pm 11	27 ANISOVICH 02	SPEC	0.6-1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$	

27 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$a_2(2030)$	$I^G(J^{PC}) = 1^-(2^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2030 ± 20	205 ± 30	28 ANISOVICH 01F	SPEC	1.96–2.41 $p\bar{p}$
28 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.				

NODE=M300J69;LINKAGE=AY

$a_3(2030)$	$I^G(J^{PC}) = 1^-(3^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2031 ± 12	150 ± 18	29 ANISOVICH 01F	SPEC	1.96–2.41 $p\bar{p}$
29 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.				

NODE=M300K23
NODE=M300K23

NODE=M300K23;LINKAGE=AN

$\eta_2(2030)$	$I^G(J^{PC}) = 0^+(2^{-+})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2030 ± 5 ± 15	205 ± 10 ± 15	ANISOVICH 00E	SPEC	
$B(a_2\pi)L=0/B(a_2\pi)L=2$				
VALUE		DOCUMENT ID	TECN	COMMENT
0.05 ± 0.03		30 ANISOVICH 11	SPEC	0.9–1.94 $p\bar{p}$

NODE=M300K20
NODE=M300K20

NODE=M300K20;LINKAGE=AN

$B(a_0\pi)/B(a_2\pi)L=2$				
VALUE		DOCUMENT ID	TECN	COMMENT
0.10 ± 0.08		31 ANISOVICH 11	SPEC	0.9–1.94 $p\bar{p}$

NODE=M300J8
NODE=M300J8NODE=M300B1
NODE=M300B1

NODE=M300B1;LINKAGE=AN

$B(f_2\eta)/B(a_2\pi)L=2$				
VALUE		DOCUMENT ID	TECN	COMMENT
0.13 ± 0.06		32 ANISOVICH 11	SPEC	0.9–1.94 $p\bar{p}$

NODE=M300B2;LINKAGE=AN

NODE=M300B2
NODE=M300B2

NODE=M300B3;LINKAGE=AN

NODE=M300B3
NODE=M300B3

NODE=M300B3;LINKAGE=AN

$f_3(2050)$	$I^G(J^{PC}) = 0^+(3^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2048 ± 8	213 ± 34	ANISOVICH 00J	SPEC	2.0 $p\bar{p} \rightarrow \eta\pi^0\pi^0$

NODE=M300J7
NODE=M300J7

$f_0(2060)$	$I^G(J^{PC}) = 0^+(0^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
~ 2050	~ 120	33 OAKDEN 94	RVUE	0.36–1.55 $p\bar{p} \rightarrow \pi\pi$
~ 2060	~ 50	33 OAKDEN 94	RVUE	0.36–1.55 $p\bar{p} \rightarrow \pi\pi$

NODE=M300J59
NODE=M300J59

OCCUR=2

NODE=M300J;LINKAGE=A

$\pi(2070)$	$I^G(J^{PC}) = 1^-(0^{-+})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2070 ± 35	310 ± 100 50	ANISOVICH 01F	SPEC	2.0 $p\bar{p} \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J91
NODE=M300J91

$X(2075)$	$I^G(J^{PC}) = ??(???)$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2075 ± 12 ± 5	90 ± 35 ± 9	34 ABLIKIM 04J	BES2	$J/\psi \rightarrow K^-\rho\Lambda$
34 From a fit in the region $M_{p\bar{\Lambda}} - M_p - M_\Lambda < 150$ MeV. S-wave in the $p\bar{\Lambda}$ system preferred.				
A similar near-threshold enhancement in the $p\bar{\Lambda}$ system is observed in $B^+ \rightarrow p\bar{\Lambda}\bar{D}^0$ by CHEN 11F.				

NODE=M300J01
NODE=M300J01

NODE=M300J01;LINKAGE=AB

$X(2080)$	$I^G(J^{PC}) = ??(???)$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2080 ± 10	110 ± 20	KREYMER 80	STRC	13 $\pi^- d \rightarrow p\bar{p}n(n_s)$

NODE=M300J35
NODE=M300J35

X(2080)	$I^G(J^{PC}) = ?^?(3^-?)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2080 \pm 10	190 \pm 15			ROZANSKA 80	SPRK	18 $\pi^- p \rightarrow p\bar{p}n$

NODE=M300J37
NODE=M300J37

a₁(2095)	$I^G(J^{PC}) = 1^-(1^{++})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2096 \pm 17 \pm 121	451 \pm 41 \pm 81	69k	KUHN	04	B852	18 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$	

NODE=M300J04
NODE=M300J04

B(a₁(2095) → f₁(1285)π) / B(a₁(2095) → a₁(1260))							
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
3.18 \pm 0.64	69k	KUHN	04	B852	18 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^- p$		

NODE=M300B03
NODE=M300B03

$\eta(2100)$	$I^G(J^{PC}) = 0^+(0^-+)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2103 \pm 50	187 \pm 75			586	35 BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$

35 ASTON 81B sees no peak, has 850 events in Ajinenko+Barth bins. ARESTOV 80 sees no peak.

NODE=M300J48
NODE=M300J48

X(2100)	$I^G(J^{PC}) = ?^?(0??)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2100 \pm 40	250 \pm 40			ALDE	86D GAM4	100 $\pi^- p \rightarrow 2\eta X$

NODE=M300J49
NODE=M300J49

X(2110)	$I^G(J^{PC}) = 1^+(3^-?)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2110 \pm 10	330 \pm 20			EVANGELIS... 79	OMEG	10,16 $\pi^- p \rightarrow \bar{p}pn$

NODE=M300J36
NODE=M300J36

f₂(2140)	$I^G(J^{PC}) = 0^+(2^{++})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2141 \pm 12	49 \pm 28			389	GREEN	86 MPSF	400 pA $\rightarrow 4KX$

NODE=M300J50
NODE=M300J50

X(2150)	$I^G(J^{PC}) = ?^?(2^+?)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2150 \pm 10	260 \pm 10			ROZANSKA 80	SPRK	18 $\pi^- p \rightarrow p\bar{p}n$

NODE=M300J38
NODE=M300J38

a₂(2175)	$I^G(J^{PC}) = 1^-(2^{++})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2175 \pm 40	310 $^{+90}_{-45}$			ANISOVICH 01F	SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J88
NODE=M300J88

$\eta(2190)$	$I^G(J^{PC}) = 0^+(0^-+)$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2190 \pm 50	850 \pm 100			BUGG 99	BES

NODE=M300J13
NODE=M300J13

$\omega_2(2195)$	$I^G(J^{PC}) = 0^-(2^{--})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2195 \pm 30	225 \pm 40	36	ANISOVICH 02B	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$	

NODE=M300J82
NODE=M300J82

$\omega(2205)$	$I^G(J^{PC}) = 0^-(1^{--})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2205 \pm 30	350 \pm 90	37	ANISOVICH 02B	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$	

NODE=M300J80
NODE=M300J80

NODE=M300J82;LINKAGE=AZ

$\omega(2205)$	$I^G(J^{PC}) = 0^-(1^{--})$	<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2205 \pm 30	350 \pm 90	37	ANISOVICH 02B	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$	

³⁷ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

X(2210)		$I^G(J^{PC}) = ?^?(???)$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2210 $^{+79}_{-21}$	203 $^{+437}_{-87}$	EVANGELIS...	79B OMEG	$10 \pi^- p \rightarrow K^+ K^- n$

X(2210)		$I^G(J^{PC}) = ?^?(???)$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2207 ± 22	130	CASO	70 HBC	$11.2 \pi^- p$

h₁(2215)		$I^G(J^{PC}) = 0^-(1^{+-})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2215 ± 40	325 ± 55	38 ANISOVICH	02B SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

³⁸ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$\rho_2(2225)$		$I^G(J^{PC}) = 1^+(2^{--})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2225 ± 35	335^{+100}_{-50}	39 ANISOVICH	02 SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

³⁹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$\rho_4(2230)$		$I^G(J^{PC}) = 1^+(4^{--})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2230 ± 25	210 ± 30	40 ANISOVICH	02 SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

⁴⁰ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$b_1(2240)$		$I^G(J^{PC}) = 1^+(1^{+-})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2240 ± 35	320 ± 85	41 ANISOVICH	02 SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

⁴¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$f_2(2240)$		$I^G(J^{PC}) = 0^+(2^{++})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2240± 15	241± 30	42 ANISOVICH	00J SPEC	$1.92\text{--}2.41 p\bar{p}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$\sim 2226 \quad \sim 226 \quad \text{HASAN} \quad 94 \quad \text{RVUE} \quad p\bar{p} \rightarrow \pi\pi$

⁴² From the combined analysis of ANISOVICH 99C, ANISOVICH 99F, ANISOVICH 99J, ANISOVICH 99K, and ANISOVICH 00B. See also ANISOVICH 12.

$b_3(2245)$		$I^G(J^{PC}) = 1^+(3^{+-})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2245 ± 50	320 ± 70	43 BUGG	04C RVUE	

⁴³ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$\eta_2(2250)$		$I^G(J^{PC}) = 0^+(2^{-+})$		
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2248 ± 20	280 ± 20	ANISOVICH	00I SPEC	
2267 ± 14	290 ± 50	ANISOVICH	00J SPEC	

NODE=M300J80;LINKAGE=AZ

NODE=M300J39
NODE=M300J39

NODE=M300J51
NODE=M300J51

NODE=M300J27
NODE=M300J27

NODE=M300J27;LINKAGE=AZ

NODE=M300J70
NODE=M300J70

NODE=M300J74
NODE=M300J74

NODE=M300J74;LINKAGE=AY

NODE=M300J87
NODE=M300J87

NODE=M300J87;LINKAGE=AY

NODE=M300K26
NODE=M300K26

NODE=M300K26;LINKAGE=AN

NODE=M300K10
NODE=M300K10

NODE=M300K10;LINKAGE=AY

NODE=M300J17
NODE=M300J17

$\pi_4(2250)$	$I^G(J^{PC}) = 1^-(4 - +)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2250 ± 15	215 ± 25	ANISOVICH	01F SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J73
NODE=M300J73

$\omega_4(2250)$	$I^G(J^{PC}) = 0^-(4 - -)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2250 ± 30	150 ± 50	44 ANISOVICH	02B SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

44 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

NODE=M300J84
NODE=M300J84

$\omega_5(2250)$	$I^G(J^{PC}) = 0^-(5 - -)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2250 ± 70	320 ± 95	45 BUGG	04 RVUE	

45 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

NODE=M300K11
NODE=M300K11

$\omega_3(2255)$	$I^G(J^{PC}) = 0^-(3 - -)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2255 ± 15	175 ± 30	46 ANISOVICH	02B SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

46 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

NODE=M300J66
NODE=M300J66

$a_4(2255)$	$I^G(J^{PC}) = 1^-(4 + +)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2237 ± 5 OUR AVERAGE				
2237 ± 5	291 ± 12	UMAN	06 E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
2255 ± 40	330 ⁺¹¹⁰ ₋₅₀	47 ANISOVICH	01F SPEC	1.96–2.41 $\bar{p}p$

47 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

NODE=M300K21
NODE=M300K21

$a_2(2255)$	$I^G(J^{PC}) = 1^-(2 + +)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2255 ± 20	230 ± 15	48 ANISOVICH	01G SPEC	1.96–2.41 $\bar{p}p$

48 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, ANISOVICH 01F, and ANISOVICH 01G.

NODE=M300K21;LINKAGE=AN

$X(2260)$	$I^G(J^{PC}) = 0^+(4+?)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2260 ± 20	400 ± 100	EVANGELIS...	79 OMEG	10,16 $\pi^- p \rightarrow \bar{p}pn$

NODE=M300J40
NODE=M300J40

$\rho(2270)$	$I^G(J^{PC}) = 1^+(1 - -)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2265 ± 40	325 ± 80	49 ANISOVICH	02 SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
2280 ± 50	440 ± 110	ATKINSON	85 OMEG	20–70 $\gamma p \rightarrow p\omega\pi^+\pi^-\pi^0$

49 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

NODE=M300J86
NODE=M300J86

$a_1(2270)$	$I^G(J^{PC}) = 1^-(1 + +)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2270 ⁺⁵⁵ ₋₄₀	305 ⁺⁷⁰ ₋₄₀	ANISOVICH	01F SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J72
NODE=M300J72

$h_3(2275)$	$I^G(J^{PC}) = 0^-(3 + -)$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2275 ± 25	190 ± 45	50 ANISOVICH	02B SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

NODE=M300J28
NODE=M300J28

50 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

a₃(2275)	$I^G(J^{PC}) = 1^-(3^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2275 ± 35	350 ± 100 50	51 ANISOVICH	01G SPEC	1.96–2.41 $p\bar{p}$
51 From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, ANISOVICH 01F, and ANISOVICH 01G.				

π₂(2285)	$I^G(J^{PC}) = 1^-(2^{-+})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2285 ± 20 ± 25	250 ± 20 ± 25	52 ANISOVICH	11 SPEC	0.9–1.94 $p\bar{p}$
52 Reanalysis of ADOMEIT 96 and ANISOVICH 00E.				

ω₃(2285)	$I^G(J^{PC}) = 0^-(3^{--})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2278 ± 28	224 ± 50	53 BUGG	04A RVUE	
2285 ± 60	230 ± 40	54 ANISOVICH	02B SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$
53 Partial wave analysis of the data on $p\bar{p} \rightarrow \bar{\Lambda}\Lambda$ from BARNES 00.				
54 From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.				

ω(2290)	$I^G(J^{PC}) = 0^-(1^{--})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	
2290 ± 20	275 ± 35	55 BUGG	04A RVUE	
55 Partial wave analysis of the data on $p\bar{p} \rightarrow \bar{\Lambda}\Lambda$ from BARNES 00.				

f₂(2295)	$I^G(J^{PC}) = 0^+(2^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2293 ± 13	216 ± 37	56 ANISOVICH	00J SPEC	1.92–2.41 $p\bar{p}$
56 From the combined analysis of ANISOVICH 99C, ANISOVICH 99F, ANISOVICH 99I, ANISOVICH 99K, and ANISOVICH 00B. See also ANISOVICH 12.				

f₃(2300)	$I^G(J^{PC}) = 0^+(3^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	
2334 ± 25	200 ± 20	57 BUGG	04A RVUE	
57 Partial wave analysis of the data on $p\bar{p} \rightarrow \bar{\Lambda}\Lambda$ from BARNES 00.				

f₁(2310)	$I^G(J^{PC}) = 0^+(1^{++})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	
2310 ± 60	255 ± 70	ANISOVICH	00J SPEC	

η(2320)	$I^G(J^{PC}) = 0^+(0^{-+})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	
2320 ± 15	230 ± 35	58 ANISOVICH	00M SPEC	
58 From the combined analysis of $\bar{p}p \rightarrow \eta\eta\eta$ from ANISOVICH 00M and $\bar{p}p \rightarrow \eta\pi^0\pi^0$ from ANISOVICH 00J.				

η₄(2330)	$I^G(J^{PC}) = 0^+(4^{-+})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2328 ± 38	240 ± 90	ANISOVICH	00J SPEC	2.0 $p\bar{p} \rightarrow \eta\pi^0\pi^0$

ω(2330)	$I^G(J^{PC}) = 0^-(1^{--})$			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2330 ± 30	435 ± 75	ATKINSON	88 OMEG	25–50 $\gamma p \rightarrow \rho^\pm \rho^0 \pi^\mp$

X(2340)	$I^G(J^{PC}) = ?(???)$			
MASS (MeV)	WIDTH (MeV)	EVTs	DOCUMENT ID	TECN COMMENT
2340 ± 20	180 ± 60	126	59 BALTAY	75 HBC 15 $\pi^+ p \rightarrow p\pi^-$

NODE=M300J28;LINKAGE=AZ

NODE=M300K19
NODE=M300K19

NODE=M300K25
NODE=M300K25

NODE=M300K25;LINKAGE=AN

NODE=M300J83
NODE=M300J83

NODE=M300J83;LINKAGE=BU
NODE=M300J83;LINKAGE=AZ

NODE=M300J02
NODE=M300J02

NODE=M300J02;LINKAGE=BU

NODE=M300K27
NODE=M300K27

NODE=M300K27;LINKAGE=AN

NODE=M300J19
NODE=M300J19

NODE=M300J19;LINKAGE=BU

NODE=M300J23
NODE=M300J23

NODE=M300J18
NODE=M300J18

NODE=M300;LINKAGE=B

NODE=M300J22
NODE=M300J22

NODE=M300J53
NODE=M300J53

NODE=M300J54
NODE=M300J54

59 Dominant decay into $\rho^0 \rho^0 \pi^+$. BALTAY 78 finds confirmation in $2\pi^+ \pi^- 2\pi^0$ events which contain $\rho^+ \rho^0 \pi^0$ and $2\rho^+ \pi^-$.

$\pi(2360)$	$I^G(J^{PC}) = 1^-(0 - +)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2360 ± 25	300^{+100}_{-50}	ANISOVICH	01F	SPEC	$2.0 \bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

NODE=M300J;LINKAGE=B1

$X(2360)$	$I^G(J^{PC}) = ??(4+?)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2360 ± 10	430 ± 30	ROZANSKA	80	SPRK	$18 \pi^- p \rightarrow p\bar{p}n$

NODE=M300J90
NODE=M300J90

$X(2440)$	$I^G(J^{PC}) = ??(5-?)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2440 ± 10	310 ± 20	ROZANSKA	80	SPRK	$18 \pi^- p \rightarrow p\bar{p}n$

NODE=M300J43
NODE=M300J43

$X(2632)$	$I^G(J^{PC}) = ??(???)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2635.2 ± 3.3		60 EVDOKIMOV	04	SELX	$X(2632) \rightarrow D_s^+ \eta$
2631.6 ± 2.1	< 17	61 EVDOKIMOV	04	SELX	$X(2632) \rightarrow D_s^0 K^+$
60 From a mass difference to D_s^+ of 666.9 ± 3.3 MeV.					
61 From a mass difference to D_s^0 of 767.0 ± 2.0 MeV.					

NODE=M300J03
NODE=M300J03

$B(X(2632) \rightarrow D_s^0 K^+)/B(X(2632) \rightarrow D_s^+ \eta)$			
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	
0.14 ± 0.06	62 EVDOKIMOV	04	SELX

62 Possible interpretation of this decay pattern is discussed by YASUI 07.

OCCUR=2

NODE=M300J03;LINKAGE=EV
NODE=M300J03;LINKAGE=ED

$X(2680)$	$I^G(J^{PC}) = ??(???)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2676 ± 27	150	CASO	70	HBC	$11.2 \pi^- p \rightarrow \rho^- \pi^+ \pi^- p$

NODE=M300J55
NODE=M300J55

$X(2710)$	$I^G(J^{PC}) = ??(6+?)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2710 ± 20	170 ± 40	ROZANSKA	80	SPRK	$18 \pi^- p \rightarrow p\bar{p}n$

NODE=M300J44
NODE=M300J44

$X(2750)$	$I^G(J^{PC}) = ??(7-?)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2747 ± 32	195 ± 75	DENNEY	83	LASS	$10 \pi^+ p \rightarrow K^+ K^- \pi^+ p$

NODE=M300J56
NODE=M300J56

$f_0(3100)$	$I^G(J^{PC}) = 0^+(6++)$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3100 ± 100	700 ± 130	BINON	05	GAMS	$33 \pi^- p \rightarrow \eta\eta n$

NODE=M300J06
NODE=M300J06

$X(3250)$	$I^G(J^{PC}) = ??(???)$	3-Body Decays				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
3250 ± 8 ± 20	45 ± 18	ALEEV	93	BIS2	$X(3250) \rightarrow \Lambda\bar{p}K^+$	
3265 ± 7 ± 20	40 ± 18	ALEEV	93	BIS2	$X(3250) \rightarrow \bar{\Lambda}pK^-$	

NODE=M300J57
NODE=M300J57

OCCUR=2

X(3250)	$I^G(J^{PC}) = ?^?(???)$	4-Body Decays			
MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT	
3245±8±20	25 ± 11	ALEEV	93	BIS2	$X(3250) \rightarrow \Lambda \bar{p} K^+ \pi^\pm$
3250±9±20	50 ± 20	ALEEV	93	BIS2	$X(3250) \rightarrow \bar{\Lambda} p K^- \pi^\mp$
3270±8±20	25 ± 11	ALEEV	93	BIS2	$X(3250) \rightarrow K_S^0 p \bar{p} K^\pm$

NODE=M300J58
NODE=M300J58

OCCUR=2
OCCUR=3

X(3350)	$I^G(J^{PC}) = ?^?(???)$	MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3350 $^{+10}_{-20}$ ±20	70 $^{+40}_{-30}$ ±40	50 ± 10	$^{63}_{\text{GABYSHEV}}$	63A	BELL	$B^- \rightarrow \Lambda_c^+ \bar{p} \pi^-$	

63 A similar enhancement in the $\Lambda_c^+ \bar{p}$ final state is also reported by BABAR collaboration in AUBERT 10H.

NODE=M300J09
NODE=M300J09

NODE=M300J09;LINKAGE=AU

NODE=M300

ABLIKIM	13J	PR D87 032008	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54955
ANISOVICH	12	PR D85 014001	A.V. Anisovich <i>et al.</i>		REFID=53961
ANASHIN	11	PL B703 543	V.V. Anashin <i>et al.</i>	(KEDR Collab.)	REFID=53932
ANISOVICH	11	EPJ C71 1511	A.V. Anisovich <i>et al.</i>	(LOQM, RAL, PNPI)	REFID=53631
CHEN	11F	PR D84 071501	P. Chen <i>et al.</i>	(BELLE Collab.)	REFID=53814
AUBERT	10H	PR D82 031102	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=53363
ABRAAMYAN	09	PR C80 034001	Kh.U. Abraamyan <i>et al.</i>		REFID=53100
LIU	09	PR D79 071102	C. Liu <i>et al.</i>	(BELLE Collab.)	REFID=52752
VLADIMIRSK...	08	PAN 71 2129	V.V. Vladimirska <i>et al.</i>	(ITEP)	REFID=52681
VLADIMIRSK...	07	PAN 70 1706	V. Vladimirska <i>et al.</i>		REFID=52058
VLADIMIRSK...	07	Translated from YAF 70 1751.			
YASUI	07	PR D76 034009	S. Yasui, M. Oka		REFID=51907
ABLIKIM	06J	PRL 96 162002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51127
ABLIKIM	06S	PRL 97 142002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51451
GABYSHEV	06A	PRL 97 242001	N. Gabyshev <i>et al.</i>	(BELLE Collab.)	REFID=51565
SCHEGELSKY	06	EPJ A27 199	V.A. Schegelsky <i>et al.</i>		REFID=51186
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky <i>et al.</i>		REFID=51185
UMAN	06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)	REFID=51063
VLADIMIRSK...	06	PAN 69 493	V.V. Vladimirska <i>et al.</i>	(ITEP, Moscow)	REFID=51191
BINON	05	PAN 68 960	F. Binon <i>et al.</i>		REFID=50780
GRIGOR'EV	05	PAN 68 1271	V.K. Grigor'ev <i>et al.</i>	(ITEP)	REFID=50844
GRIGOR'EV	05	Translated from YAF 68 1324.			
LU	05	PRL 94 032002	M. Lu <i>et al.</i>	(BNL E852 Collab.)	REFID=50459
ABLIKIM	04J	PRL 93 112002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50196
BUGG	04	PL B595 556 (errat)	D.V. Bugg		REFID=49763
BUGG	04A	EPJ C36 161	D.V. Bugg		REFID=50158
BUGG	04C	PRPL 397 257	D.V. Bugg		REFID=50203
EVDOKIMOV	04	PRL 93 242001	A.V. Evdokimov <i>et al.</i>	(SELEX Collab.)	REFID=50337
KUHN	04	PL B595 109	J. Kuhn <i>et al.</i>	(BNL E852 Collab.)	REFID=49773
ANISOVICH	03	EPJ A16 229	V.V. Anisovich <i>et al.</i>		REFID=49401
VLADIMIRSK...	03	PAN 66 700	V.V. Vladimirska <i>et al.</i>		REFID=49419
ANISOVICH	02	PL B542 8	A.V. Anisovich <i>et al.</i>		REFID=48828
ANISOVICH	02B	PL B542 19	A.V. Anisovich <i>et al.</i>		REFID=48829
CHUNG	02	PR D65 072001	S.U. Chung <i>et al.</i>	(BNL E852 Collab.)	REFID=48837
LINK	02K	PL B545 50	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)	REFID=48845
ANISOVICH	01C	PL B507 23	A.V. Anisovich <i>et al.</i>		REFID=48325
ANISOVICH	01D	PL B508 6	A.V. Anisovich <i>et al.</i>		REFID=48327
ANISOVICH	01E	PL B513 281	A.V. Anisovich <i>et al.</i>		REFID=48349
ANISOVICH	01F	PL B517 261	A.V. Anisovich <i>et al.</i>		REFID=48352
ANISOVICH	01G	PL B517 273	A.V. Anisovich <i>et al.</i>		REFID=48353
ANISOVICH	00B	NP A662 319	A.V. Anisovich <i>et al.</i>		REFID=47942
ANISOVICH	00D	PL B476 15	A.V. Anisovich <i>et al.</i>		REFID=47944
ANISOVICH	00E	PL B477 19	A.V. Anisovich <i>et al.</i>		REFID=47945
ANISOVICH	00I	PL B491 40	A.V. Anisovich <i>et al.</i>		REFID=47949
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>		REFID=47950
ANISOVICH	00M	PL B496 145	A.V. Anisovich <i>et al.</i>		REFID=48009
BARNES	00	PR C62 055203	P.D. Barnes <i>et al.</i>		REFID=47965
FILIPPI	00	PL B495 284	A. Filippi <i>et al.</i>	(OBELIX Experiment)	REFID=48006
VLADIMIRSKII	00	JETPL 72 486	V.V. Vladimirska <i>et al.</i>		REFID=47997
VLADIMIRSKII	00	Translated from ZETFP 72 698.			
ANISOVICH	99C	PL B452 173	A.V. Anisovich <i>et al.</i>		REFID=46903
ANISOVICH	99E	PL B452 187	A.V. Anisovich <i>et al.</i>		REFID=46902
ANISOVICH	99F	NP A651 253	A.V. Anisovich <i>et al.</i>		REFID=46926
ANISOVICH	99J	PL B471 271	A.V. Anisovich <i>et al.</i>		REFID=47416
ANISOVICH	99K	PL B468 309	A.V. Anisovich <i>et al.</i>		REFID=47472
BUGG	99	PL B458 511	D.V. Bugg <i>et al.</i>		REFID=46938
FERRER	99	EPJ C10 249	A. Ferrer <i>et al.</i>		REFID=47404
SEmenov	99	SPU 42 847	S.V. Semenov		REFID=47363
ADOMEIT	96	Translated from UFN 42 937.			REFID=45202
KLOET	96	ZPHY C71 227	J. Adomeit <i>et al.</i>	(Crystal Barrel Collab.)	REFID=45212
PROKOSHKIN	96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)	REFID=45182
PROKOSHKIN	96	SPD 41 247	Y.D. Prokoshkin, V.D. Samoilenko	(SERP)	
ANISOVICH	99	Translated from DANS 348 481.			
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)	REFID=44103
OAKDEN	94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)	REFID=45210
ALEEV	93	PAN 56 1358	A.N. Aleev <i>et al.</i>	(BIS-2 Collab.)	REFID=43668
		Translated from YAF 56 100.			

ARMSTRONG	93D	PL B307 399	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	REFID=43596
ALBRECHT	91F	ZPHY C50 1	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=41658
CONDO	91	PR D43 2787	G.T. Condo <i>et al.</i>	(SLAC Hybrid Collab.)	REFID=41588
BISELLO	89B	PR D39 701	G. Busetto <i>et al.</i>	(DM2 Collab.)	REFID=40575
ATKINSON	88	ZPHY C38 535	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=40556
DAFTARI	87	PRL 58 859	I.K. Daftari <i>et al.</i>	(SYRA)	REFID=40412
ALDE	86D	NP B269 485	D.M. Alde <i>et al.</i>	(BELG, LAPP, SERP, CERN+)	REFID=20765
BRIDGES	86D	PL B180 313	D.L. Bridges <i>et al.</i>	(SYRA, BNL, CASE+)	REFID=21984
GREEN	86	PRL 56 1639	D.R. Green <i>et al.</i>	(FNAL, ARIZ, FSU+)	REFID=21872
ATKINSON	85	ZPHY C29 333	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=22000
DENNEY	83	PR D28 2726	D.L. Denney <i>et al.</i>	(IOWA, MICH)	REFID=20754
ASTON	81B	NP B189 205	D. Aston <i>et al.</i>	(BONN, CERN, EPOL, GLAS+)	REFID=11553
ARESTOV	80	IHEP 80-165	Y.I. Arestov <i>et al.</i>	(SERP)	REFID=22312
CHLIAPNIK...	80	ZPHY C3 285	P.V. Chliapnikov <i>et al.</i>	(SERP, BRUX, MONS)	REFID=21996
KREYMER	80	PR D22 36	A.E. Kreymer <i>et al.</i>	(IND, PURD, SLAC+)	REFID=21970
ROZANSKA	80	NP B162 505	M. Rozanska <i>et al.</i>	(MPIIM, CERN)	REFID=21774
EVANGELIS...	79	NP B153 253	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)	REFID=21966
EVANGELIS...	79B	NP B154 381	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)	REFID=21967
BALTAJ	78	PR D17 52	C. Baltay <i>et al.</i>	(COLU, BING)	REFID=21569
ANTIPOV	77	NP B119 45	Y.M. Antipov <i>et al.</i>	(SERP, GEVA)	REFID=20728
BALTAJ	77	PRL 39 591	C. Baltay, C.V. Cautis, M. Kalekar	(COLU)	REFID=20847
BALTAJ	75	PRL 35 891	C. Baltay <i>et al.</i>	(COLU, BING)	REFID=21994
KALELKAR	75	Thesis Nevis 207	M.S. Kalekar	(COLU)	REFID=21564
CASO	70	LNC 3 707	C. Caso <i>et al.</i>	(GENO, HAMB, MILA, SACL)	REFID=20590

STRANGE MESONS ($S = \pm 1$, $C = B = 0$)

$K^+ = u\bar{s}$, $K^0 = d\bar{s}$, $\bar{K}^0 = \bar{d}s$, $K^- = \bar{u}s$, similarly for K^* 's

$K_0^*(800)$

$I(J^P) = \frac{1}{2}(0^+)$

or κ

OMMITTED FROM SUMMARY TABLE

Needs confirmation. See the mini-review on scalar mesons under $f_0(500)$ (see the index for the page number).

NODE=MXXX020

NODE=MXXX020

NODE=M174

NODE=M174

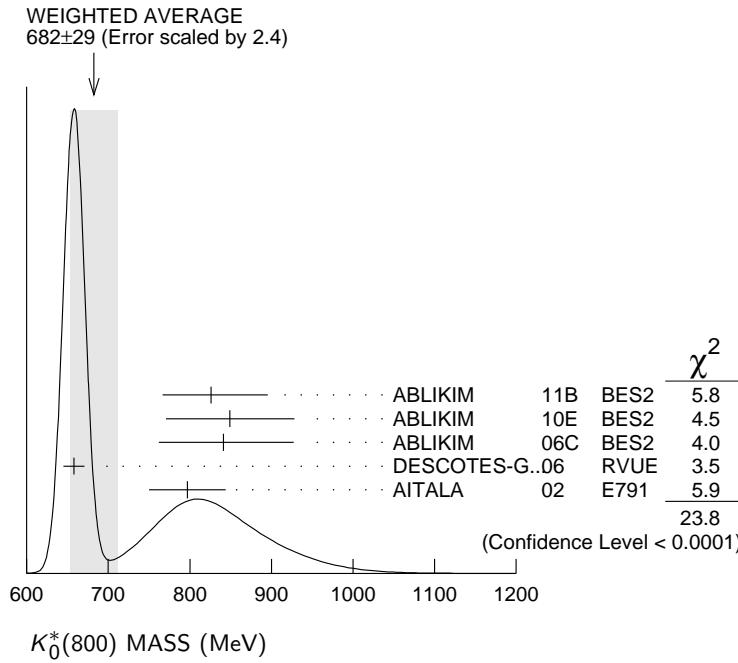
NODE=M174M

NODE=M174M

$K_0^*(800)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
682 ± 29 OUR AVERAGE				Error includes scale factor of 2.4. See the ideogram below.	
826 ± 49	+49 -34	1338	1 ABLIKIM	11B BES2 $J/\psi \rightarrow K_S^0 K_S^0 \pi^+ \pi^-$	
849 ± 77	+18 -14	1421	2,3 ABLIKIM	10E BES2 $J/\psi \rightarrow K^\pm K_S^0 \pi^\mp \pi^0$	
841 ± 30	+81 -73	25k	4,5 ABLIKIM	06C BES2 $J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$	
658 ± 13			6 DESCOTES-G..06	$\pi K \rightarrow \pi K$	
797 ± 19	±43	15k	7,8 AITALA	02 E791 $D^+ \rightarrow K^- \pi^+ \pi^+$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
663 ± 8	±34		9 BUGG	10 RVUE S-matrix pole	
706.0 ± 1.8	±22.8	141k	10 BONVICINI	08A CLEO $D^+ \rightarrow K^- \pi^+ \pi^+$	
856 ± 17	±13	54k	11 LINK	07B FOCS $D^+ \rightarrow K^- \pi^+ \pi^+$	
750 ± 30			12 BUGG	06 RVUE	
855 ± 15		0.6k	13 CAWLFIELD	06A CLEO $D^0 \rightarrow K^+ K^- \pi^0$	
694 ± 53			3,14 ZHOU	06 RVUE $Kp \rightarrow K^- \pi^+ n$	
753 ± 52			15 PELAEZ	04A RVUE $K\pi \rightarrow K\pi$	
594 ± 79			14 ZHENG	04 RVUE $K^- p \rightarrow K^- \pi^+ n$	
722 ± 60			16 BUGG	03 RVUE 11 $K^- p \rightarrow K^- \pi^+ n$	
905 ± 65			17 ISHIDA	97B RVUE 11 $K^- p \rightarrow K^- \pi^+ n$	

- 1 The Breit-Wigner parameters from a fit with seven intermediate resonances. The S-matrix pole position is $(764 \pm 63^{+71}_{-54}) - i(306 \pm 149^{+143}_{-85})$ MeV.
- 2 From a fit including ten additional resonances and energy-independent Breit-Wigner width.
- 3 S-matrix pole.
- 4 S-matrix pole. GUO 06 in a chiral unitary approach report a mass of 757 ± 33 MeV and a width of 558 ± 82 MeV.
- 5 A fit in the $K_0^*(800) + K^*(892) + K^*(1410)$ model with mass and width of the $K_0^*(800)$ from ABLIKIM 06C well describes the left slope of the $K_S^0 \pi^-$ invariant mass spectrum in $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$ decay studied by EPIFANOV 07.
- 6 S-matrix pole. Using Roy-Steiner equations (ROY 71) as well as unitarity, analyticity and crossing symmetry constraints.
- 7 Not seen by KOPP 01 using 7070 events of $D^0 \rightarrow K^- \pi^+ \pi^0$. LINK 02E and LINK 05I show clear evidence for a constant non-resonant scalar amplitude rather than $K_0^*(800)$ in their high statistics analysis of $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$.
- 8 AUBERT 07T does not find evidence for the charged $K_0^*(800)$ using 11k events of $D^0 \rightarrow K^- K^+ \pi^0$.
- 9 S-Matrix pole. Supersedes BUGG 06. Combined analysis of ASTON 88, ABLIKIM 06C, AITALA 06, and LINK 09 using an s-dependent width with couplings to $K\pi$ and $K\eta'$, and the Adler zero near thresholds.
- 10 T-matrix pole.
- 11 A Breit-Wigner mass and width.
- 12 S-matrix pole. Reanalysis of ASTON 88, AITALA 02, and ABLIKIM 06C using for the κ an s-dependent width with an Adler zero near threshold.
- 13 Breit-Wigner parameters. A significant S-wave can be also modeled as a non-resonant contribution.
- 14 Using ASTON 88.
- 15 T-matrix pole. Reanalysis of data from LINGLIN 73, ESTABROOKS 78, and ASTON 88 in the unitarized ChPT model.
- 16 T-matrix pole. Reanalysis of ASTON 88 data.
- 17 Reanalysis of ASTON 88 using interfering Breit-Wigner amplitudes.



$K_0^*(800)$ WIDTH					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
547 ± 24 OUR AVERAGE		Error includes scale factor of 1.1.			
449 ± 156	+144 -81	1338	18 ABLIKIM	11B BES2	$J/\psi \rightarrow K_S^0 K_S^0 \pi^+ \pi^-$
512 ± 80	+92 -44	1421	19,20 ABLIKIM	10E BES2	$J/\psi \rightarrow K^\pm K_S^0 \pi^\mp \pi^0$
618 ± 90	+96 -144	25k	19,21 ABLIKIM	06C BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
557 ± 24			22 DESCOTES-G..06	RVUE	$\pi K \rightarrow \pi K$
410 ± 43	± 87	15k	23,24 AITALA	02 E791	$D^+ \rightarrow K^- \pi^+ \pi^+$

NODE=M174M;LINKAGE=LI

NODE=M174M;LINKAGE=BL

NODE=M174M;LINKAGE=SM

NODE=M174M;LINKAGE=AB

NODE=M174M;LINKAGE=EP

NODE=M174M;LINKAGE=DE

NODE=M174M;LINKAGE=A

NODE=M174M;LINKAGE=AU

NODE=M174M;LINKAGE=BG

NODE=M174M;LINKAGE=TM

NODE=M174M;LINKAGE=BW

NODE=M174M;LINKAGE=BU

NODE=M174M;LINKAGE=CA

NODE=M174M;LINKAGE=ZH

NODE=M174M;LINKAGE=PE

NODE=M174M;LINKAGE=A1

NODE=M174M;LINKAGE=IS

NODE=M174W

NODE=M174W

• • • We do not use the following data for averages, fits, limits, etc. • • •

658	± 10	± 44	25	BUGG	10	RVUE	S-matrix pole
638.8	± 4.4	± 40.4	141k	26	BONVICINI	08A CLEO	$D^+ \rightarrow K^- \pi^+ \pi^+$
464	± 28	± 22	54k	27	LINK	07B FOCS	$D^+ \rightarrow K^- \pi^+ \pi^+$
684	± 120			28	BUGG	06 RVUE	
251	± 48		0.6k	29	CAWLFIELD	06A CLEO	$D^0 \rightarrow K^+ K^- \pi^0$
606	± 59			19,30	ZHOU	06 RVUE	$K p \rightarrow K^- \pi^+ n$
470	± 66			31	PELAEZ	04A RVUE	$K \pi \rightarrow K \pi$
724	± 332			30	ZHENG	04 RVUE	$K^- p \rightarrow K^- \pi^+ n$
772	± 100			32	BUGG	03 RVUE	$11 K^- p \rightarrow K^- \pi^+ n$
545	+235	-110		33	ISHIDA	97B RVUE	$11 K^- p \rightarrow K^- \pi^+ n$

- 18 The Breit-Wigner parameters from a fit with seven intermediate resonances. The S-matrix pole position is $(764 \pm 63^{+71}_{-54}) - i(306 \pm 149^{+143}_{-85})$ MeV.
- 19 S-matrix pole.
- 20 From a fit including ten additional resonances and energy-independent Breit-Wigner width.
- 21 A fit in the $K_0^*(800) + K^*(892) + K^*(1410)$ model with mass and width of the $K_0^*(800)$ from ABLIKIM 06C well describes the left slope of the $K_0^0 \pi^-$ invariant mass spectrum in $\tau^- \rightarrow K_0^0 \pi^- \nu_\tau$ decay studied by EPIFANOV 07.
- 22 S-matrix pole. Using Roy-Steiner equations (ROY 71) as well as unitarity, analyticity and crossing symmetry constraints.
- 23 Not seen by KOPP 01 using 7070 events of $D^0 \rightarrow K^- \pi^+ \pi^0$. LINK 02E and LINK 05I show clear evidence for a constant non-resonant scalar amplitude rather than $K_0^*(800)$ in their high statistics analysis of $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$.
- 24 AUBERT 07T does not find evidence for the charged $K_0^*(800)$ using 11k events of $D^0 \rightarrow K^- K^+ \pi^0$.
- 25 S-Matrix pole. Supersedes BUGG 06. Combined analysis of ASTON 88, ABLIKIM 06C, AITALA 06, and LINK 09 using an s-dependent width with couplings to $K\pi$ and $K\eta'$, and the Adler zero near thresholds.
- 26 T-matrix pole.
- 27 A Breit-Wigner mass and width.
- 28 S-matrix pole. Reanalysis of ASTON 88, AITALA 02, and ABLIKIM 06C using for the κ an s-dependent width with an Adler zero near threshold.
- 29 Statistical error only. A fit to the Dalitz plot including the $K_0^*(800)^{\pm}$, $K^*(892)^{\pm}$, and ϕ resonances modeled as Breit-Wigners. A significant S-wave can be also modeled as a non-resonant contribution.
- 30 Using ASTON 88.
- 31 T-matrix pole. Reanalysis of data from LINGLIN 73, ESTABROOKS 78, and ASTON 88 in the unitarized ChPT model.
- 32 T-matrix pole. Reanalysis of ASTON 88 data.
- 33 Reanalysis of ASTON 88 using interfering Breit-Wigner amplitudes.

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REFID=51107

K₀^{*}(800) REFERENCES

ABLIKIM	11B	PL B698 183	M. Ablikim <i>et al.</i>	(BES II Collab.)
ABLIKIM	10E	PL B693 88	M. Ablikim <i>et al.</i>	(BES II Collab.)
BUGG	10	PR D81 014002	D.V. Bugg	(LOQM)
LINK	09	PL B681 14	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
BONVICINI	08A	PR D78 052001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
AUBERT	07T	PR D76 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)
EPIFANOV	07	PL B654 65	D. Epifanov <i>et al.</i>	(BELLE Collab.)
LINK	07B	PL B653 1	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
ABLIKIM	06C	PL B633 681	M. Ablikim <i>et al.</i>	(BES Collab.)
AITALA	06	PR D73 032004	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
Also		PR D74 059901 (errat.)	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BUGG	06	PL B632 471	D.V. Bugg	(LOQM)
CAWLFIELD	06A	PR D74 031108	C. Cawfield <i>et al.</i>	(CLEO Collab.)
DESCOTES-G... 06		EPJ C48 553	S. Descotes-Genon, B. Moussallam	
GUO	06	NP A773 78	F.K. Guo <i>et al.</i>	
ZHOU	06	NP A775 212	Z.Y. Zhou, H.Q. Zheng	
LINK	05I	PL B621 72	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
PELAEZ	04A	MPL A19 2879	J.R. Pelaez	
ZHENG	04	NP A733 235	H.Q. Zheng <i>et al.</i>	
BUGG	03	PL B572 1	D.V. Bugg	
AITALA	02	PRL 89 121801	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
LINK	02E	PL B535 43	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
KOPP	01	PR D63 092001	S. Kopp <i>et al.</i>	(CLEO Collab.)
ISHIDA	97B	PTP 98 621	S. Ishida <i>et al.</i>	
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ESTABROOKS	78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)
LINGLIN	73	NP B55 408	D. Linglin	(CERN)
ROY	71	PL 36B 353	S.M. Roy	

$K^*(892)$ $I(J^P) = \frac{1}{2}(1^-)$

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 $K^*(892)$ MASS**CHARGED ONLY, HADROPRODUCED**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
891.66 ± 0.26 OUR AVERAGE					
892.6 ± 0.5	5840	BAUBILLIER	84B	HBC	—
888 ± 3		NAPIER	84	SPEC	+
891 ± 1		NAPIER	84	SPEC	—
891.7 ± 2.1	3700	BARTH	83	HBC	+
891 ± 1	4100	TOAFF	81	HBC	—
892.8 ± 1.6		AJINENKO	80	HBC	+
890.7 ± 0.9	1800	AGUILAR-...	78B	HBC	±
886.6 ± 2.4	1225	BALAND	78	HBC	±
891.7 ± 0.6	6706	COOPER	78	HBC	±
891.9 ± 0.7	9000	¹ PALER	75	HBC	—
892.2 ± 1.5	4404	AGUILAR-...	71B	HBC	—
891 ± 2	1000	CRENNELL	69D	DBC	—
890 ± 3.0	720	BARLOW	67	HBC	±
889 ± 3.0	600	BARLOW	67	HBC	±
891 ± 2.3	620	² DEBAERE	67B	HBC	+
891.0 ± 1.2	1700	³ WOJCICKI	64	HBC	—

• • • We do not use the following data for averages, fits, limits, etc. • • •

893.5 ± 1.1	27k	⁴ ABELE	99D	CBAR	±
890.4 ± 0.2 ± 0.5	80 ± 0.8 k	⁵ BIRD	89	LASS	—
890.0 ± 2.3	800	^{2,3} CLELAND	82	SPEC	+
896.0 ± 1.1	3200	^{2,3} CLELAND	82	SPEC	+
893 ± 1	3600	^{2,3} CLELAND	82	SPEC	—
896.0 ± 1.9	380	DELFOSSE	81	SPEC	+
886.0 ± 2.3	187	DELFOSSE	81	SPEC	—
894.2 ± 2.0	765	² CLARK	73	HBC	—
894.3 ± 1.5	1150	^{2,3} CLARK	73	HBC	—
892.0 ± 2.6	341	² SCHWEING...68		HBC	—

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CHARGED ONLY, PRODUCED IN τ LEPTON DECAYS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$895.47 \pm 0.20 \pm 0.74$	53k	⁶ EPIFANOV	07	BELL $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
892.0 ± 0.5		⁷ BOITO	10	RVUE $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
892.0 ± 0.9		^{8,9} BOITO	09	RVUE $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
895.3 ± 0.2		^{8,10} JAMIN	08	RVUE $\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
896.4 ± 0.9	11970	¹¹ BONVICINI	02	CLEO $\tau^- \rightarrow K^- \pi^0 \nu_\tau$
895 ± 2		¹² BARATE	99R	ALEP $\tau^- \rightarrow K^- \pi^0 \nu_\tau$

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NODE=M018MCT**NEUTRAL ONLY**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
895.81 ± 0.19 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below. [895.94 ± 0.22 MeV OUR 2012 AVERAGE Scale factor = 1.4]
[895.94 ± 0.22 MeV OUR 2012 AVERAGE Scale factor = 1.4]				
895.4 ± 0.2 ± 0.2	243k	¹³ DEL-AMO-SA..11I	BABR	$D^+ \rightarrow K^- \pi^+ e^+ \nu_e$
895.7 ± 0.2 ± 0.3	141k	¹⁴ BONVICINI	08A	CLEO $D^+ \rightarrow K^- \pi^+ \pi^+$
$895.41 \pm 0.32^{+0.35}_{-0.43}$	18k	¹⁵ LINK	05I	FOCS $D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$
896 ± 2		BARBERIS	98E	OMEG $450 pp \rightarrow p_f p_s K^* \bar{K}^*$
895.9 ± 0.5 ± 0.2		ASTON	88	LASS $11 K^- p \rightarrow K^- \pi^+ n$
894.52 ± 0.63	25k	¹ ATKINSON	86	OMEG $20-70 \gamma p$
894.63 ± 0.76	20k	¹ ATKINSON	86	OMEG $20-70 \gamma p$
897 ± 1	28k	EVANGELIS...	80	OMEG $10 \pi^- p \rightarrow K^+ \pi^- (\Lambda, \Sigma)$
898.4 ± 1.4	1180	AGUILAR-...	78B	HBC $0.76 \bar{p} p \rightarrow K^+ K_S^0 \pi^\pm$
894.9 ± 1.6		WICKLUND	78	ASPK $3,4,6 K^\pm N \rightarrow (K\pi)^0 N$
897.6 ± 0.9		BOWLER	77	DBC $5.4 K^+ d \rightarrow K^+ \pi^- pp$
895.5 ± 1.0	3600	MCCUBBIN	75	HBC $3.6 K^- p \rightarrow K^- \pi^+ n$

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NEW

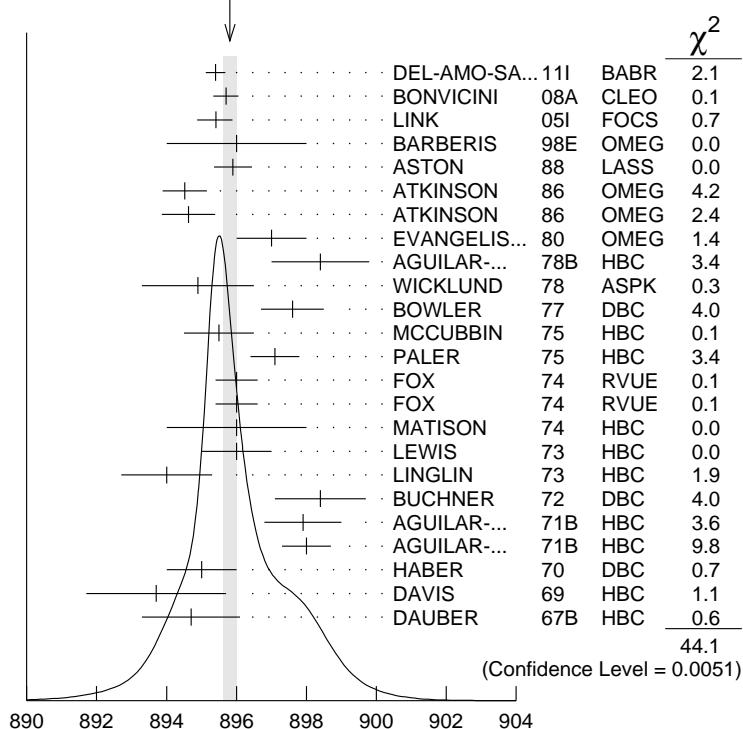
OCCUR=2

897.1 \pm 0.7	22k	¹ PALER	75	HBC	14.3 $K^- p \rightarrow (K\pi)^0 X$
896.0 \pm 0.6	10k	FOX	74	RVUE	2 $K^- p \rightarrow K^- \pi^+ n$
896.0 \pm 0.6		FOX	74	RVUE	2 $K^+ n \rightarrow K^+ \pi^- p$
896 \pm 2		¹⁶ MATISON	74	HBC	12 $K^+ p \rightarrow K^+ \pi^- \Delta$
896 \pm 1	3186	LEWIS	73	HBC	2.1–2.7 $K^+ p \rightarrow K\pi\pi p$
894.0 \pm 1.3		¹⁶ LINGLIN	73	HBC	2–13 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$
898.4 \pm 1.3	1700	² BUCHNER	72	DBC	4.6 $K^+ n \rightarrow K^+ \pi^- p$
897.9 \pm 1.1	2934	² AGUILAR...	71B	HBC	3.9, 4.6 $K^- p \rightarrow K^- \pi^+ n$
898.0 \pm 0.7	5362	² AGUILAR...	71B	HBC	3.9, 4.6 $K^- p \rightarrow K^- \pi^+ \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
895 \pm 1	4300	³ HABER	70	DBC	3 $K^- N \rightarrow K^- \pi^+ X$
893.7 \pm 2.0	10k	DAVIS	69	HBC	12 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$
894.7 \pm 1.4	1040	² DAUBER	67B	HBC	2.0 $K^- p \rightarrow K^- \pi^+ \pi^- p$

OCCUR=2

OCCUR=2

WEIGHTED AVERAGE
895.81 \pm 0.19 (Error scaled by 1.4)

 $K^*(892)^0$ mass (MeV)

1 Inclusive reaction. Complicated background and phase-space effects.

2 Mass errors enlarged by us to Γ/\sqrt{N} . See note.

3 Number of events in peak reevaluated by us.

4 K-matrix pole.

5 From a partial wave amplitude analysis.

6 From a fit in the $K_0^*(800) + K^*(892) + K^*(1410)$ model.7 From the pole position of the $K\pi$ vector form factor using EPIFANOV 07 and constraints from K_{J3} decays in ANTONELLI 10.

8 Systematic uncertainties not estimated.

9 From the pole position of the $K\pi$ vector form factor in the complex s -plane and using EPIFANOV 07 data.

10 Reanalysis of EPIFANOV 07 using resonance chiral theory.

11 Calculated by us from the shift by 4.7 ± 0.9 MeV (statistical uncertainty only) reported in BONVICINI 02 with respect to the world average value from PDG 00.12 With mass and width of the $K^*(1410)$ fixed at 1412 MeV and 227 MeV, respectively.13 Taking into account the $K^*(892)^0$, S-wave and P-wave ($K^*(1410)^0$).14 From the isobar model with a complex pole for the κ .

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15 Fit to $K\pi$ mass spectrum includes a non-resonant scalar component.

16 From pole extrapolation.

17 This value comes from a fit with χ^2 of 178/117.

A REVIEW GOES HERE – Check our WWW List of Reviews

$$m_{K^*(892)^0} - m_{K^*(892)^\pm}$$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
6.7±1.2 OUR AVERAGE					
7.7±1.7	2980	AGUILAR-...	78B	HBC	± 0 $0.76 \bar{p}p \rightarrow K^\mp K_S^0 \pi^\pm$
5.7±1.7	7338	AGUILAR-...	71B	HBC	-0 $3.9, 4.6 K^- p$
6.3±4.1	283	18 BARASH	67B	HBC	$0.0 \bar{p}p$

18 Number of events in peak reevaluated by us.

$K^*(892)$ RANGE PARAMETER

All from partial wave amplitude analyses.

VALUE (GeV $^{-1}$)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
Average is meaningless.		[3.6 ± 0.6 GeV $^{-1}$ OUR 2012 AVERAGE]			
2.1 ± 0.5 ± 0.5	243k	19 DEL-AMO-SA.11I	BABR	0	$D^+ \rightarrow K^- \pi^+ e^+ \nu_e$
3.96±0.54 ^{+1.31} _{-0.90}	18k	20 LINK	05I	FOCS	$D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$
3.4 ± 0.7		ASTON	88	LASS	0 $11 K^- p \rightarrow K^- \pi^+ n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
12.1 ± 3.2 ± 3.0		BIRD	89	LASS	$-$ $11 K^- p \rightarrow \bar{K}^0 \pi^- p$

19 Taking into account the $K^*(892)^0$, S-wave and P-wave ($K^*(1410)^0$).

20 Fit to $K\pi$ mass spectrum includes a non-resonant scalar component.

$K^*(892)$ WIDTH

CHARGED ONLY, HADROPRODUCED

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
50.8±0.9 OUR FIT					
50.8±0.9 OUR AVERAGE					
49 ± 2	5840	BAUBILLIER	84B	HBC	$-$ $8.25 K^- p \rightarrow \bar{K}^0 \pi^- p$
56 ± 4		NAPIER	84	SPEC	$-$ $200 \pi^- p \rightarrow 2K_S^0 X$
51 ± 2	4100	TOAFF	81	HBC	$-$ $6.5 K^- p \rightarrow \bar{K}^0 \pi^- p$
50.5±5.6		AJINENKO	80	HBC	$+$ $32 K^+ p \rightarrow K^0 \pi^+ X$
45.8±3.6	1800	AGUILAR-...	78B	HBC	\pm $0.76 \bar{p}p \rightarrow K^\mp K_S^0 \pi^\pm$
52.0±2.5	6706	21 COOPER	78	HBC	\pm $0.76 \bar{p}p \rightarrow (K\pi)^\pm X$
52.1±2.2	9000	22 PALER	75	HBC	$-$ $14.3 K^- p \rightarrow (K\pi)^- X$
46.3±6.7	765	21 CLARK	73	HBC	$-$ $3.13 K^- p \rightarrow \bar{K}^0 \pi^- p$
48.2±5.7	1150	21,23 CLARK	73	HBC	$-$ $3.3 K^- p \rightarrow \bar{K}^0 \pi^- p$
54.3±3.3	4404	21 AGUILAR-...	71B	HBC	$-$ $3.9, 4.6 K^- p \rightarrow (K\pi)^- p$
46 ± 5	1700	21,23 WOJCICKI	64	HBC	$-$ $1.7 K^- p \rightarrow \bar{K}^0 \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
54.8±1.7	27k	24 ABELE	99D	CBAR	\pm $0.0 \bar{p}p \rightarrow K^+ K^- \pi^0$
45.2±1.7	79.7±0.8k	25 BIRD	89	LASS	$-$ $11 K^- p \rightarrow \bar{K}^0 \pi^- p$
42.8±7.1	3700	BARTH	83	HBC	$+$ $70 K^+ p \rightarrow K^0 \pi^+ X$
64.0±9.2	800	21,23 CLELAND	82	SPEC	$+$ $30 K^+ p \rightarrow K_S^0 \pi^+ p$
62.0±4.4	3200	21,23 CLELAND	82	SPEC	$+$ $50 K^+ p \rightarrow K_S^0 \pi^+ p$
55 ± 4	3600	21,23 CLELAND	82	SPEC	$-$ $50 K^+ p \rightarrow K_S^0 \pi^- p$
62.6±3.8	380	DELFOSSÉ	81	SPEC	$+$ $50 K^\pm p \rightarrow K^\pm \pi^0 p$
50.5±3.9	187	DELFOSSÉ	81	SPEC	$-$ $50 K^\pm p \rightarrow K^\pm \pi^0 p$

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CHARGED ONLY, PRODUCED IN τ LEPTON DECAYS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
46.2±0.6±1.2	53k	26 EPIFANOV	07 BELL	$\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
46.5±1.1	27 BOITO	10 RVUE	$\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$	
46.2±0.4	28,29 BOITO	09 RVUE	$\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$	
47.5±0.4	28,30 JAMIN	08 RVUE	$\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$	
55 ± 8	31 BARATE	99R ALEP	$\tau^- \rightarrow K^- \pi^0 \nu_\tau$	

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NEUTRAL ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
47.4 ±0.6 OUR FIT	Error includes scale factor of 2.2. [48.7 ± 0.8 MeV OUR 2012 FIT Scale factor = 1.7]			

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NEW

47.4 ±0.6 OUR AVERAGE	Error includes scale factor of 2.0. See the ideogram below. [48.7 ± 0.7 MeV OUR 2012 AVERAGE Scale factor = 1.6]
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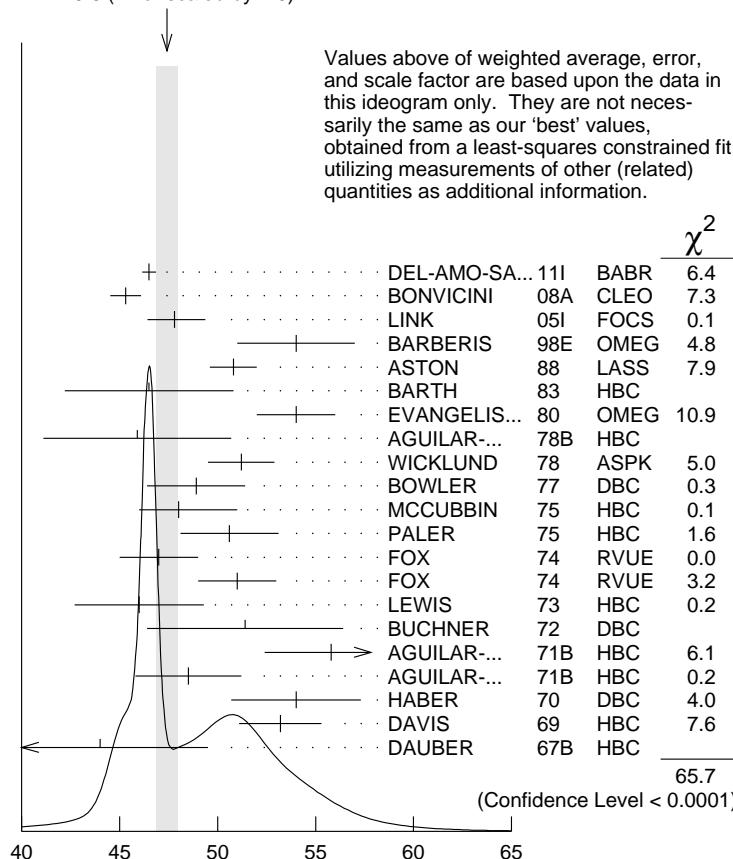
NEW

46.5 ± 0.3 ± 0.2	243k	32 DEL-AMO-SA..11I	BABR	$D^+ \rightarrow K^- \pi^+ e^+ \nu_e$	
45.3 ± 0.5 ± 0.6	141k	33 BONVICINI	08A CLEO	$D^+ \rightarrow K^- \pi^+ \pi^+$	
47.79±0.86 ^{+1.32} _{-1.06}	18k	34 LINK	05I FOCS	$D^+ \rightarrow K^- \pi^+ \mu^+ \nu_\mu$	
54 ± 3		BARBERIS	98E OMEG	$450 pp \rightarrow p_f p_s K^* \bar{K}^*$	
50.8 ± 0.8 ± 0.9		ASTON	88 LASS	$11 K^- p \rightarrow K^- \pi^+ n$	
46.5 ± 4.3	5900	BARTH	83 HBC	$70 K^+ p \rightarrow K^+ \pi^- X$	
54 ± 2	28k	EVANGELIS...	80 OMEG	$10 \pi^- p \rightarrow K^+ \pi^- (\Lambda, \Sigma)$	
45.9 ± 4.8	1180	AGUILAR-...	78B HBC	$0.76 \bar{p}p \rightarrow K^\mp K_S^0 \pi^\pm$	
51.2 ± 1.7		WICKLUND	78 ASPK	$3,4,6 K^\pm N \rightarrow (K\pi)^0 N$	
48.9 ± 2.5		BOWLER	77 DBC	$5.4 K^+ d \rightarrow K^+ \pi^- pp$	
48 ± 3	3600	MCCUBBIN	75 HBC	$3.6 K^- p \rightarrow K^- \pi^+ n$	
50.6 ± 2.5	22k	22 PALER	75 HBC	$14.3 K^- p \rightarrow (K\pi)^0 X$	
47 ± 2	10k	FOX	74 RVUE	$2 K^- p \rightarrow K^- \pi^+ n$	
51 ± 2		FOX	74 RVUE	$2 K^+ n \rightarrow K^+ \pi^- p$	OCCUR=2
46.0 ± 3.3	3186	21 LEWIS	73 HBC	$2.1-2.7 K^+ p \rightarrow K\pi\pi p$	
51.4 ± 5.0	1700	21 BUCHNER	72 DBC	$4.6 K^+ n \rightarrow K^+ \pi^- p$	
55.8 ± 4.2	2934	21 AGUILAR-...	71B HBC	$3.9,4.6 K^- p \rightarrow K^- \pi^+ n$	
48.5 ± 2.7	5362	AGUILAR-...	71B HBC	$3.9,4.6 K^- p \rightarrow K^- \pi^+ \pi^- p$	OCCUR=2
54.0 ± 3.3	4300	21,23 HABER	70 DBC	$3 K^- N \rightarrow K^- \pi^+ X$	
53.2 ± 2.1	10k	21 DAVIS	69 HBC	$12 K^+ p \rightarrow K^+ \pi^- \pi^+ p$	
44 ± 5.5	1040	21 DAUBER	67B HBC	$2.0 K^- p \rightarrow K^- \pi^+ \pi^- p$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
45.7 ± 1.1 ± 0.5	14.4k	35 MITCHELL	09A CLEO	$D_s^+ \rightarrow K^+ K^- \pi^+$	
50.6 ± 0.9	20k	28 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^{*0} K^\pm \pi^\mp \gamma$	

OCCUR=2

OCCUR=2

WEIGHTED AVERAGE
47.4±0.6 (Error scaled by 2.0)



NEUTRAL ONLY (MeV)

- 21 Width errors enlarged by us to $4 \times \Gamma/\sqrt{N}$; see note.
- 22 Inclusive reaction. Complicated background and phase-space effects.
- 23 Number of events in peak reevaluated by us.
- 24 K-matrix pole.
- 25 From a partial wave amplitude analysis.
- 26 From a fit in the $K_0^*(800) + K^*(892) + K^*(1410)$ model.
- 27 From the pole position of the $K\pi$ vector form factor using EPIFANOV 07 and constraints from K_{l3} decays in ANTONELLI 10.
- 28 Systematic uncertainties not estimated.
- 29 From the pole position of the $K\pi$ vector form factor in the complex s -plane and using EPIFANOV 07 data.
- 30 Reanalysis of EPIFANOV 07 using resonance chiral theory.
- 31 With mass and width of the $K^*(1410)$ fixed at 1412 MeV and 227 MeV, respectively.
- 32 Taking into account the $K^*(892)^0$, S-wave and P-wave ($K^*(1410)^0$).
- 33 From the isobar model with a complex pole for the κ .
- 34 Fit to $K\pi$ mass spectrum includes a non-resonant scalar component.
- 35 This value comes from a fit with χ^2 of 178/117.

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NODE=M018W2;LINKAGE=JA

NODE=M018W5;LINKAGE=BA

NODE=M018W2;LINKAGE=DE

NODE=M018W2;LINKAGE=BO

NODE=M018M2;LINKAGE=LI

NODE=M018W2;LINKAGE=MI

NODE=M018220;NODE=M018

DESIG=1;OUR EVAL;→ UNCHECKED ←

DESIG=11

DESIG=12

DESIG=4

DESIG=3

DESIG=2

$K^*(892)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 $K\pi$	~ 100	%
Γ_2 $(K\pi)^\pm$	(99.901 ± 0.009) %	
Γ_3 $(K\pi)^0$	(99.754 ± 0.021) %	
Γ_4 $K^0\gamma$	(2.46 ± 0.21) × 10 ⁻³	
Γ_5 $K^\pm\gamma$	(9.9 ± 0.9) × 10 ⁻⁴	
Γ_6 $K\pi\pi$	< 7	× 10 ⁻⁴ 95%

CONSTRAINED FIT INFORMATION

An overall fit to the total width and a partial width uses 13 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 7.8$ for 11 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|cc} x_5 & -100 \\ \Gamma & 19 & -19 \\ \hline x_2 & & x_5 \end{array}$$

Mode	Rate (MeV)	
$\Gamma_2 (K\pi)^{\pm}$	50.7 ± 0.9	DESIG=11
$\Gamma_5 K^{\pm}\gamma$	0.050 ± 0.005	DESIG=3

CONSTRAINED FIT INFORMATION

An overall fit to the total width and a partial width uses 22 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 66.8$ for 20 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|cc} x_4 & -100 \\ \Gamma & 15 & -15 \\ \hline x_3 & & x_4 \end{array}$$

Mode	Rate (MeV)	Scale factor	
$\Gamma_3 (K\pi)^0$	47.3 ± 0.6	2.1	DESIG=12
$\Gamma_4 K^0\gamma$	0.116 ± 0.010		DESIG=4

$K^*(892)$ PARTIAL WIDTHS

$\Gamma(K^0\gamma)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	Γ_4
116 ± 10 OUR FIT [117 ± 10 keV OUR 2012 FIT]						
116.5 ± 9.9	584	CARLSMITH	86	SPEC	0	$K_L^0 A \rightarrow K_S^0 \pi^0 A$

NODE=M018225

NODE=M018W4
NODE=M018W4
NEW

$\Gamma(K^\pm\gamma)$

VALUE (keV)	DOCUMENT ID	TECN	CHG	COMMENT	Γ_5
50 ± 5 OUR FIT					
50 ± 5 OUR AVERAGE					
48 ± 11	BERG	83	SPEC	-	$156 K^- A \rightarrow \bar{K}\pi A$
51 ± 5	CHANDLEE	83	SPEC	+	$200 K^+ A \rightarrow K\pi A$

NODE=M018W3
NODE=M018W3

$K^*(892)$ BRANCHING RATIOS

$\Gamma(K^0\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	DOCUMENT ID	TECN	CHG	COMMENT	Γ_4/Γ
2.46 ± 0.21 OUR FIT [(2.39 ± 0.21) $\times 10^{-3}$ OUR 2012 FIT]					
1.5 ± 0.7	CARITHERS	75B	CNTR	0	$8-16 \bar{K}^0 A$

NODE=M018230

NODE=M018R3
NODE=M018R3
NEW

• • • We do not use the following data for averages, fits, limits, etc. • • •

$\Gamma(K^\pm\gamma)/\Gamma_{\text{total}}$ VALUE (units 10^{-3}) CL%**0.99±0.09 OUR FIT**

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.6 95 BEMPORAD 73 CNTR + 10–16 K^+A $\Gamma(K\pi\pi)/\Gamma((K\pi)^\pm)$

VALUE CL%

< 7×10^{-4} 95 JONGEJANS 78 HBC 4 $K^- p \rightarrow p\bar{K}^0 2\pi$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 20×10^{-4} WOJCICKI 64 HBC – 1.7 $K^- p \rightarrow \bar{K}^0 \pi^- p$ Γ_5/Γ

NODE=M018R2

NODE=M018R2

 Γ_6/Γ_2

NODE=M018R1

NODE=M018R1

 $K^*(892)$ REFERENCES

DEL-AMO-SA... 111	PR D83 072001	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=16493
ANTONELLI 10	EPJ C69 399	M. Antonelli <i>et al.</i>	(FlaviaNet Working Group)	REFID=53448
BOITO 10	JHEP 1009 031	D.R. Boito, R. Escrivano, M. Jamin	(BARC)	REFID=53632
BOITO 09	EPJ C59 821	D.R. Boito, R. Escrivano, M. Jamin		REFID=52728
MITCHELL 09A	PR D79 072008	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)	REFID=52756
BONVICINI 08A	PR D78 052001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)	REFID=52426
JAMIN 08	PL B664 78	M. Jamin, A. Pich, J. Portoles		REFID=52285
AUBERT 07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51908
EPIFANOV 07	PL B654 65	D. Epifanov <i>et al.</i>	(BELLE Collab.)	REFID=51929
LINK 05I	PL B621 72	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)	REFID=50679
BONVICINI 02	PRL 88 111803	G. Bonvicini <i>et al.</i>	(CLEO Collab.)	REFID=48701
PDG 00	EPJ C15 1	D.E. Groom <i>et al.</i>		REFID=47469
ABELE 99D	PL B468 178	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)	REFID=47401
BARATE 99R	EPJ C11 599	R. Barate <i>et al.</i>	(ALEPH Collab.)	REFID=47366
BARBERIS 98E	PL B436 204	D. Barberis <i>et al.</i>	(Omega Expt.)	REFID=46348
BIRD 89	SLAC-332	P.F. Bird	(SLAC)	REFID=41002
ASTON 88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=40262
ATKINSON 86	ZPHY C30 521	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=20564
CARLSMITH 86	PRL 56 18	D. Carlsmith <i>et al.</i>	(EFI, SACL)	REFID=22461
BAUBILLIER 84B	ZPHY C26 37	M. Baubillier <i>et al.</i>	(BIRL, CERN, GLAS+)	REFID=22459
NAPIER 84	PL 149B 514	A. Napier <i>et al.</i>	(TUFTS, ARIZ, FNAL, FLOR+)	REFID=22460
BARTH 83	NP B223 296	M. Barth <i>et al.</i>	(BRUX, CERN, GENO, MONS+)	REFID=22456
BERG 83	Thesis UMI 83-21652	D.M. Berg	(ROCH)	REFID=22457
CHANDLEE 83	PR D51 168	C. Chandlee <i>et al.</i>	(ROCH, FNAL, MINN)	REFID=22458
CLELAND 82	NP B208 189	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)	REFID=22455
DELFOSS 81	NP B183 349	A. Delfosse <i>et al.</i>	(GEVA, LAUS)	REFID=21277
TOAFF 81	PR D23 1500	S. Toaff <i>et al.</i>	(ANL, KANS)	REFID=22454
AJINENKO 80	ZPHY C5 177	I.V. Ajinenko <i>et al.</i>	(SERP, BRUX, MONS+)	REFID=22449
EVANGELIS... 80	NP B165 383	C. Evangelista <i>et al.</i>	(BARI, BONN, CERN+)	REFID=22450
AGUILAR-... 78B	NP B141 101	M. Aguilar-Benitez <i>et al.</i>	(MADR, TATA+)	REFID=22438
BALAND 78	NP B140 220	J.F. Baland <i>et al.</i>	(MONS, BELG, CERN+)	REFID=20369
COOPER 78	NP B136 365	A.M. Cooper <i>et al.</i>	(TATA, CERN, CDEF+)	REFID=22441
JONGEJANS 78	NP B139 383	B. Jongejans <i>et al.</i>	(ZEEM, CERN, NIJM+)	REFID=22445
WICKLUND 78	PR D17 1197	A.B. Wicklund <i>et al.</i>	(ANL)	REFID=20124
BOWLER 77	NP B126 31	M.G. Bowler <i>et al.</i>	(OXF)	REFID=22437
CARTHERS 75B	PRL 35 349	W.C.J. Cartthers <i>et al.</i>	(ROCH, MCGI)	REFID=22433
MCCUBBIN 75	NP B86 13	N.A. McCubbin, L. Lyons	(OXF)	REFID=22434
PALER 75	NP B96 1	K. Paler <i>et al.</i>	(RHEL, SACL, EPOL)	REFID=22435
FOX 74	NP B80 403	G.C. Fox, M.L. Griss	(CIT)	REFID=22430
MATISON 74	PR D9 1872	M.J. Matison <i>et al.</i>	(LBL)	REFID=22431
BEMPORAD 73	NP B51 1	C. Bemporad <i>et al.</i>	(CERN, ETH, LOIC)	REFID=22416
CLARK 73	NP B54 432	A.G. Clark, L. Lyons, D. Radojicic	(OXF)	REFID=22426
LEWIS 73	NP B60 283	P.H. Lewis <i>et al.</i>	(LOWC, LOIC, CDEF)	REFID=22427
LINGLIN 73	NP B55 408	D. Linglin	(CERN)	REFID=22428
BUCHNER 72	NP B45 333	K. Buchner <i>et al.</i>	(MPIM, CERN, BRUX)	REFID=22418
AGUILAR-... 71B	PR D4 2583	M. Aguilar-Benitez, R.L. Eisner, J.B. Kinson	(BNL)	REFID=22408
HABER 70	NP B17 289	B. Haber <i>et al.</i>	(REHO, SACL, BGNA, EPOL)	REFID=22406
CRENNELL 69D	PRL 22 487	D.J. Crennell <i>et al.</i>	(BNL)	REFID=22399
DAVIS 69	PRL 23 1071	P.J. Davis <i>et al.</i>	(LRL)	REFID=22400
SCHWEING... 68	PR 166 1317	F. Schweingruber <i>et al.</i>	(ANL, NWES)	REFID=22398
BARASH 67B	PR 156 1399	N. Barash <i>et al.</i>	(COLU)	REFID=20160
BARLOW 67	NC 50A 701	J. Barlow <i>et al.</i>	(CERN, CDEF, IRAD, LIVP)	REFID=20041
DAUBER 67B	PR 153 1403	P.M. Dauber <i>et al.</i>	(UCLA)	REFID=22389
DEBAERE 67B	NC 51A 401	W. de Baere <i>et al.</i>	(BRUX, CERN)	REFID=22390
WOJCICKI 64	PR 135 B484	S.G. Wojcicki	(LRL)	REFID=22379

$K_1(1270)$ $I(J^P) = \frac{1}{2}(1^+)$ **$K_1(1270)$ MASS**VALUE (MeV) DOCUMENT ID**1272±7 OUR AVERAGE** Includes data from the 2 datablocks that follow this one.**PRODUCED BY K^- , BACKWARD SCATTERING, HYPERON EXCHANGE**VALUE (MeV) EVTS DOCUMENT ID TECN CHG COMMENT

The data in this block is included in the average printed for a previous datablock.

1275±10 700 GAVILLET 78 HBC + $4.2 K^- p \rightarrow \Xi^- (K\pi\pi)^+$ **PRODUCED BY K BEAMS**VALUE (MeV) DOCUMENT ID TECN CHG COMMENT

The data in this block is included in the average printed for a previous datablock.

1270±10 ¹ DAUM 81C CNTR - $63 K^- p \rightarrow K^- 2\pi p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

~1276	² TORNQVIST	82B RVUE		
~1300	VERGEEST	79	HBC	-
1289±25	³ CARNEGIE	77	ASPK	±
~1300	BRANDENB...	76	ASPK	±
~1270	OTTER	76	HBC	-
1260	DAVIS	72	HBC	+
1234±12	FIRESTONE	72B DBC	+	$12 K^+ p$

¹ Well described in the chiral unitary approach of GENG 07 with two poles at 1195 and 1284 MeV and widths of 246 and 146 MeV, respectively.

² From a unitarized quark-model calculation.

³ From a model-dependent fit with Gaussian background to BRANDENBURG 76 data.

PRODUCED BY BEAMS OTHER THAN K MESONSVALUE (MeV) EVTS DOCUMENT ID TECN CHG COMMENT**1248.1± 3.3±1.4** GULER 11 BELL $B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1279 ±10	25k	⁴ ABLIKIM	06C BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
1294 ±10	310	RODEBACK	81 HBC	$4 \pi^- p \rightarrow \Lambda K 2\pi$
1300	40	CRENNELL	72 HBC	0 $4.5 \pi^- p \rightarrow \Lambda K 2\pi$
1242 ⁺⁹ ₋₁₀		⁵ ASTIER	69 HBC	0 $\bar{p} p$
1300	45	CRENNELL	67 HBC	0 $6 \pi^- p \rightarrow \Lambda K 2\pi$

⁴ Systematic errors not estimated.

⁵ This was called the C meson.

PRODUCED IN τ LEPTON DECAYSVALUE (MeV) EVTS DOCUMENT ID TECN CHG COMMENT**1254±33±34** 7k ASNER 00B CLEO ± $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$ **$K_1(1270)$ WIDTH**VALUE (MeV) DOCUMENT ID**90±20 OUR ESTIMATE** This is only an educated guess; the error given is larger than the error on the average of the published values.**87± 7 OUR AVERAGE** Includes data from the 2 datablocks that follow this one.**PRODUCED BY K^- , BACKWARD SCATTERING, HYPERON EXCHANGE**VALUE (MeV) EVTS DOCUMENT ID TECN CHG COMMENT

The data in this block is included in the average printed for a previous datablock.

75±15 700 GAVILLET 78 HBC + $4.2 K^- p \rightarrow \Xi^- K\pi\pi$

NODE=M028205

NODE=M028MX

NODE=M028M2

NODE=M028M2

NODE=M028M3

NODE=M028M3

NODE=M028M3;LINKAGE=DA

NODE=M028M3;LINKAGE=T

NODE=M028M3;LINKAGE=E

NODE=M028M1

NODE=M028M1

NODE=M028M1;LINKAGE=AB

NODE=M028M1;LINKAGE=A

NODE=M028MT

NODE=M028MT

NODE=M028210

NODE=M028WX

→ UNCHECKED ←

NODE=M028W2

NODE=M028W2

PRODUCED BY K BEAMS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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The data in this block is included in the average printed for a previous datablock.

90± 8	⁶ DAUM	81C CNTR	—	63 $K^- p \rightarrow K^- 2\pi p$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

~ 150	VERGEEST	79	HBC	—	4.2 $K^- p \rightarrow (\bar{K}\pi\pi)^- p$
150±71	⁷ CARNEGIE	77	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
~ 200	BRANDENB...	76	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
120	DAVIS	72	HBC	+	12 $K^+ p$
188±21	FIRESTONE	72B	DBC	+	12 $K^+ d$

6 Well described in the chiral unitary approach of GENG 07 with two poles at 1195 and 1284 MeV and widths of 246 and 146 MeV, respectively.

7 From a model-dependent fit with Gaussian background to BRANDENBURG 76 data.

PRODUCED BY BEAMS OTHER THAN K MESONS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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119.5± 5.2±6.7	GULER	11	BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

131 ±21	25k	⁸ ABLIKIM	06C BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
66 ±15	310	RODEBACK	81	HBC $4 \pi^- p \rightarrow \Lambda K 2\pi$
60	40	CRENNELL	72	HBC 0 $4.5 \pi^- p \rightarrow \Lambda K 2\pi$
127 +7 -25		ASTIER	69	HBC 0 $\bar{p}p$
60	45	CRENNELL	67	HBC 0 $6 \pi^- p \rightarrow \Lambda K 2\pi$

8 Systematic errors not estimated.

PRODUCED IN τ LEPTON DECAYS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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260⁺⁹⁰₋₇₀±80	7k	ASNER	00B	CLEO	± $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$
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 $K_1(1270)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)			
Γ_1 $K\rho$	(42 ± 6) %			
Γ_2 $K_0^*(1430)\pi$	(28 ± 4) %			
Γ_3 $K^*(892)\pi$	(16 ± 5) %			
Γ_4 $K\omega$	(11.0 ± 2.0) %			
Γ_5 $Kf_0(1370)$	(3.0 ± 2.0) %			
Γ_6 γK^0	seen			

 $K_1(1270)$ PARTIAL WIDTHS

$\Gamma(K\rho)$	Γ_1
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<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

57±5	MAZZUCATO	79	HBC	+	4.2 $K^- p \rightarrow \Xi^-(K\pi\pi)^+$
75±6	CARNEGIE	77B	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$

$\Gamma(K_0^*(1430)\pi)$	Γ_2
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<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

26±6	CARNEGIE	77B	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
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$\Gamma(K^*(892)\pi)$	Γ_3
---	------------------------------

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

14±11	MAZZUCATO	79	HBC	+	4.2 $K^- p \rightarrow \Xi^-(K\pi\pi)^+$
2± 2	CARNEGIE	77B	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$

NODE=M028W3

NODE=M028W3

NODE=M028W3;LINKAGE=DA

NODE=M028W3;LINKAGE=E

NODE=M028W1

NODE=M028W1

NODE=M028W1;LINKAGE=AB

NODE=M028WT

NODE=M028WT

DESIG=2

DESIG=7

DESIG=1

DESIG=5

DESIG=8

DESIG=9;OUR EST;→ UNCHECKED ←

NODE=M028220

NODE=M028W5

NODE=M028W5

NODE=M028W7

NODE=M028W7

NODE=M028W4

NODE=M028W4

$\Gamma(K\omega)$

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4±4	MAZZUCATO 79	HBC	+	4.2 $K^- p \rightarrow \Xi^-(K\pi\pi)^+$
24±3	CARNEGIE 77B	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$

 Γ_4

NODE=M028W6
NODE=M028W6

 $\Gamma(K\eta(1370))$

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
22±5	CARNEGIE 77B	ASPK	±	13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$

 Γ_5

NODE=M028W8
NODE=M028W8

 $\Gamma(\gamma K^0)$

<u>VALUE</u> (keV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
73.2±6.1±28.3	ALAVI-HARATI02B	KTEV	$K + A \rightarrow K^* + A$	

 Γ_6

NODE=M028W9
NODE=M028W9

 $K_1(1270)$ BRANCHING RATIOS $\Gamma(K\rho)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.42 ±0.06	9 DAUM	81C CNTR	$63 K^- p \rightarrow K^- 2\pi p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.584±0.043	10 GULER	11 BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$
dominant	RODEBACK 81	HBC	$4 \pi^- p \rightarrow \Lambda K 2\pi$

 Γ_1/Γ

NODE=M028225

 $\Gamma(K_0^*(1430)\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.28 ±0.04	9 DAUM	81C CNTR	$63 K^- p \rightarrow K^- 2\pi p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.0201±0.0064	10 GULER	11 BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$

 Γ_2/Γ

NODE=M028R4
NODE=M028R4

 $\Gamma(K^*(892)\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.16 ±0.05	9 DAUM	81C CNTR	$63 K^- p \rightarrow K^- 2\pi p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.171±0.023	10 GULER	11 BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$

 Γ_3/Γ

NODE=M028R1
NODE=M028R1

 $\Gamma(K\omega)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.11 ±0.02	9 DAUM	81C CNTR	$63 K^- p \rightarrow K^- 2\pi p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.225±0.052	10 GULER	11 BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$

 Γ_4/Γ

NODE=M028R3
NODE=M028R3

 $\Gamma(K\omega)/\Gamma(K\rho)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.30	95	RODEBACK	81 HBC	$4 \pi^- p \rightarrow \Lambda K 2\pi$

 Γ_4/Γ_1

NODE=M028R6
NODE=M028R6

 $\Gamma(K\eta(1370))/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.03±0.02	9 DAUM	81C CNTR	$63 K^- p \rightarrow K^- 2\pi p$

 Γ_5/Γ

NODE=M028R5
NODE=M028R5

D-wave/S-wave RATIO FOR $K_1(1270) \rightarrow K^*(892)\pi$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.0±0.7	9 DAUM	81C CNTR	$63 K^- p \rightarrow K^- 2\pi p$

 Γ_5/Γ

NODE=M028R9
NODE=M028R9

9 Average from low and high t data.

10 Assuming that decays are saturated by the $K\rho$, $K_0^*(1430)\pi$, $K^*(892)\pi$, $K\omega$ decay modes and neglecting interference between them. The values $B(\omega \rightarrow \pi^+ \pi^-) = (1.53^{+0.11}_{-0.13})\%$ and $B(K_0^*(1430) \rightarrow K\pi) = (93 \pm 10)\%$ are used. Systematic uncertainties not estimated.

NODE=M028R;LINKAGE=F
NODE=M028R1;LINKAGE=GU

K₁(1270) REFERENCES

GULER	11	PR D83 032005	H. Guler <i>et al.</i>	(BELLE Collab.)
GENG	07	PR D75 014017	L.S. Geng <i>et al.</i>	
ABLIKIM	06C	PL B633 681	M. Ablikim <i>et al.</i>	(BES Collab.)
ALAVI-HARATI	02B	PRL 89 072001	A. Alavi-Harati <i>et al.</i>	(FNAL KTeV Collab.)
ASNER	00B	PR D62 072006	D.M. Asner <i>et al.</i>	(CLEO Collab.)
TORNQVIST	82B	NP B203 268	N.A. Tornqvist	(HELS)
DAUM	81C	NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)
RODEBACK	81	ZPHY C9 9	S. Rodeback <i>et al.</i>	(CERN, CDEF, MADR+)
MAZZUCATO	79	NP B156 532	M. Mazzucato <i>et al.</i>	(CERN, ZEEM, NIJM+)
VERGEEST	79	NP B158 265	J.S.M. Vergeest <i>et al.</i>	(NIJM, AMST, CERN+)
GAVILLET	78	PL 76B 517	P. Gavillet <i>et al.</i>	(AMST, CERN, NIJM+) JP
CARNEGIE	77	NP B127 509	R.K. Carnegie <i>et al.</i>	(SLAC)
CARNEGIE	77B	PL 68B 287	R.K. Carnegie <i>et al.</i>	(SLAC)
BRANDENB...	76	PRL 36 703	G.W. Brandenburg <i>et al.</i>	(SLAC) JP
OTTER	76	NP B106 77	G. Otter <i>et al.</i>	(AACH3, BERL, CERN, LOIC-) JP
CRENNELL	72	PR D6 1220	D.J. Crennell <i>et al.</i>	(BNL)
DAVIS	72	PR D5 2688	P.J. Davis <i>et al.</i>	(LBL)
FIRESTONE	72B	PR D5 505	A. Firestone <i>et al.</i>	(LBL)
ASTIER	69	NP B10 65	A. Astier <i>et al.</i>	(CDEF, CERN, IPNP, LIVP) IJP
CRENNELL	67	PRL 19 44	D.J. Crennell <i>et al.</i>	(BNL) I

NODE=M028

REFID=53668
REFID=51623
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REFID=22505
REFID=22506
REFID=22482
REFID=22473

K₁(1400)

$$I(J^P) = \frac{1}{2}(1^+)$$

K₁(1400) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1403± 7 OUR AVERAGE					
1463±64±68	7k	ASNER	00B	CLEO	± $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$
1373±14±18	1	ASTON	87	LASS	0 11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1392±18		BAUBILLIER	82B	HBC	0 8.25 $K^- p \rightarrow K_S^0 \pi^+ \pi^- n$
1410±25		DAUM	81C	CNTR	— 63 $K^- p \rightarrow K^- 2\pi p$
1415±15		ETKIN	80	MPS	0 6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1404±10	2	CARNEGIE	77	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1418± 8	25k	3 ABLIKIM	06C	BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
~1350		4 TORNQVIST	82B	RVUE	
~1400		VERGEEST	79	HBC	— 4.2 $K^- p \rightarrow (\bar{K}\pi\pi)^- p$
~1400		BRANDENB...	76	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
1420		DAVIS	72	HBC	± 12 $K^+ p$
1368±18		FIRESTONE	72B	DBC	± 12 $K^+ d$

NODE=M064

1 From partial-wave analysis of $K^0 \pi^+ \pi^-$ system.
 2 From a model-dependent fit with Gaussian background to BRANDENBURG 76 data.
 3 Systematic errors not estimated.
 4 From a unitarized quark-model calculation.

NODE=M064M

NODE=M064M

K₁(1400) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
174± 13 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.					
300 ⁺³⁷⁰ ₋₁₁₀ ±140	7k	ASNER	00B	CLEO	± $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$
188± 54± 60	5	ASTON	87	LASS	0 11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
276± 65		BAUBILLIER	82B	HBC	0 8.25 $K^- p \rightarrow K_S^0 \pi^+ \pi^- n$
195± 25		DAUM	81C	CNTR	— 63 $K^- p \rightarrow K^- 2\pi p$
180± 10		ETKIN	80	MPS	0 6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
142± 16	6	CARNEGIE	77	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
152± 16	25k	7 ABLIKIM	06C	BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$
~200		VERGEEST	79	HBC	— 4.2 $K^- p \rightarrow (\bar{K}\pi\pi)^- p$
~160		BRANDENB...	76	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
80		DAVIS	72	HBC	± 12 $K^+ p$
241± 30		FIRESTONE	72B	DBC	± 12 $K^+ d$

NODE=M064M;LINKAGE=P

NODE=M064M;LINKAGE=E

NODE=M064M;LINKAGE=AB

NODE=M064M;LINKAGE=T

NODE=M064W

NODE=M064W

5 From partial-wave analysis of $K^0\pi^+\pi^-$ system.

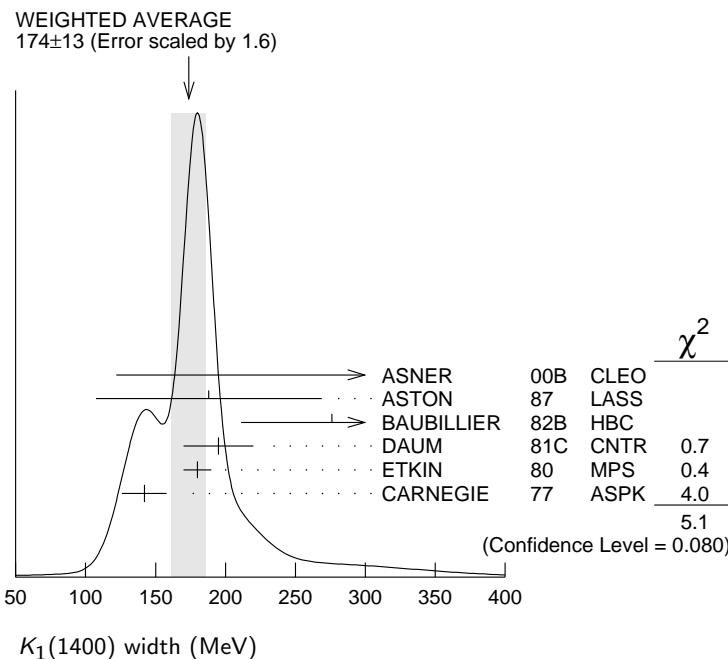
6 From a model-dependent fit with Gaussian background to BRANDENBURG 76 data.

7 Systematic errors not estimated.

NODE=M064W;LINKAGE=P

NODE=M064W;LINKAGE=E

NODE=M064W;LINKAGE=AB



$K_1(1400)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K^*(892)\pi$	(94 ± 6) %
$\Gamma_2 K\rho$	(3.0 ± 3.0) %
$\Gamma_3 Kf_0(1370)$	(2.0 ± 2.0) %
$\Gamma_4 K\omega$	(1.0 ± 1.0) %
$\Gamma_5 K_0^*(1430)\pi$	not seen
$\Gamma_6 \gamma K^0$	seen

$K_1(1400)$ PARTIAL WIDTHS

$\Gamma(K^*(892)\pi)$	Γ_1			
VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
117±10	CARNEGIE	77	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
$\Gamma(K\rho)$	Γ_2			
VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
2±1	CARNEGIE	77	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
$\Gamma(K\omega)$	Γ_4			
VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
23±12	CARNEGIE	77	ASPK	± 13 $K^\pm p \rightarrow (K\pi\pi)^\pm p$
$\Gamma(\gamma K^0)$	Γ_6			
VALUE (keV)	DOCUMENT ID	TECN	CHG	COMMENT
280.8±23.2±40.4	ALAVI-HARATI02B	KTEV		$K + A \rightarrow K^* + A$

$K_1(1400)$ BRANCHING RATIOS

$\Gamma(K^*(892)\pi)/\Gamma_{\text{total}}$	Γ_1/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
0.94±0.06	8 DAUM	81C CNTR	63 $K^- p \rightarrow K^- 2\pi p$	
$\Gamma(K\rho)/\Gamma_{\text{total}}$	Γ_2/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
0.03±0.03	8 DAUM	81C CNTR	63 $K^- p \rightarrow K^- 2\pi p$	

NODE=M064215;NODE=M064

DESIG=1

DESIG=2

DESIG=8

DESIG=5

DESIG=7;OUR EST;→ UNCHECKED ←
DESIG=9;OUR EST;→ UNCHECKED ←

NODE=M064220

NODE=M064W1

NODE=M064W1

NODE=M064W2

NODE=M064W2

NODE=M064W5

NODE=M064W5

NODE=M064W6

NODE=M064W6

NODE=M064225

NODE=M064R1

NODE=M064R1

NODE=M064R2

NODE=M064R2

$\Gamma(K f_0(1370))/\Gamma_{\text{total}}$					Γ_3/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.02±0.02	8 DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$	
$\Gamma(K\omega)/\Gamma_{\text{total}}$					Γ_4/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.01±0.01	8 DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$	
$\Gamma(K_0^*(1430)\pi)/\Gamma_{\text{total}}$					Γ_5/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
not seen	8 DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$	
D-wave/S-wave RATIO FOR $K_1(1400) \rightarrow K^*(892)\pi$					
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.04±0.01	8 DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$	

8 Average from low and high t data.

K₁(1400) REFERENCES

ABLIKIM	06C	PL B633 681	M. Ablikim <i>et al.</i>	(BES Collab.)
ALAVI-HARATI	02B	PRL 89 072001	A. Alavi-Harati <i>et al.</i>	(FNAL KTeV Collab.)
ASNER	00B	PR D62 072006	D.M. Asner <i>et al.</i>	(CLEO Collab.)
ASTON	87	NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
BAUBILLIER	82B	NP B202 21	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
TORNQVIST	82B	NP B203 268	N.A. Tornqvist	(HELS)
DAUM	81C	NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)
ETKIN	80	PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP
VERGEEST	79	NP B158 265	J.S.M. Vergeest <i>et al.</i>	(NIJM, AMST, CERN+)
CARNEGIE	77	NP B127 509	R.K. Carnegie <i>et al.</i>	(SLAC)
BRANDENBURG	76	PRL 36 703	G.W. Brandenburg <i>et al.</i>	(SLAC) JP
DAVIS	72	PR D5 2688	P.J. Davis <i>et al.</i>	(LBL)
FIRESTONE	72B	PR D5 505	A. Firestone <i>et al.</i>	(LBL)

K^{*}(1410)

$$I(J^P) = \frac{1}{2}(1^-)$$

K^{*}(1410) MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
1414±15 OUR AVERAGE	Error includes scale factor of 1.3.			
1380±21±19	ASTON	88	LASS 0	11 $K^- p \rightarrow K^- \pi^+ n$
1420±7±10	ASTON	87	LASS 0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1276 ⁺⁷² ₋₇₇	1,2 BOITO	09	RVUE	$\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
1367±54	BIRD	89	LASS	—
1474±25	BAUBILLIER	82B	HBC 0	8.25 $K^- p \rightarrow \bar{K}^0 2\pi n$
1500±30	ETKIN	80	MPS 0	6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

1 From the pole position of the $K\pi$ vector form factor in the complex s -plane and using EPIFANOV 07 data.

2 Systematic uncertainties not estimated.

K^{*}(1410) WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
232± 21 OUR AVERAGE	Error includes scale factor of 1.1.			
176± 52±22	ASTON	88	LASS 0	11 $K^- p \rightarrow K^- \pi^+ n$
240± 18±12	ASTON	87	LASS 0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
198 ^{+ 61} _{- 87}	3,4 BOITO	09	RVUE	$\tau^- \rightarrow K_S^0 \pi^- \nu_\tau$
114±101	BIRD	89	LASS	—
275± 65	BAUBILLIER	82B	HBC 0	8.25 $K^- p \rightarrow \bar{K}^0 2\pi n$
500±100	ETKIN	80	MPS 0	6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

3 From the pole position of the $K\pi$ vector form factor in the complex s -plane and using EPIFANOV 07 data.

4 Systematic uncertainties not estimated.

NODE=M064R5
NODE=M064R5

NODE=M064R3
NODE=M064R3

NODE=M064R4
NODE=M064R4

NODE=M064R9
NODE=M064R9

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NODE=M064

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REFID=22506

NODE=M094

NODE=M094M

NODE=M094M

NODE=M094M;LINKAGE=BI

NODE=M094M;LINKAGE=NS

NODE=M094W

NODE=M094W

NODE=M094W;LINKAGE=BI

NODE=M094W;LINKAGE=NS

K*(1410) DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 K^*(892)\pi$	> 40 %	95%
$\Gamma_2 K\pi$	(6.6 ± 1.3) %	
$\Gamma_3 K\rho$	< 7 %	95%
$\Gamma_4 \gamma K^0$	seen	

K*(1410) PARTIAL WIDTHS

$\Gamma(\gamma K^0)$	Γ_4
VALUE (keV)	DOCUMENT ID TECN COMMENT

< 52.9	CL% ASTON	DOCUMENT ID ALAVI-HARATI02B	TECN KTEV	COMMENT $K + A \rightarrow K^* + A$
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K*(1410) BRANCHING RATIOS

$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$	Γ_3/Γ_1
VALUE CL%	DOCUMENT ID TECN CHG COMMENT

$\Gamma(K\pi)/\Gamma(K^*(892)\pi)$	Γ_2/Γ_1
VALUE CL%	DOCUMENT ID TECN CHG COMMENT

$\Gamma(K\pi)/\Gamma_{\text{total}}$	Γ_2/Γ
VALUE DOCUMENT ID TECN CHG COMMENT	

0.066 ± 0.010 ± 0.008	ASTON	88 LASS 0	11 $K^- p \rightarrow K^- \pi^+ n$
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K*(1410) REFERENCES

BOITO 09 EPJ C59 821	D.R. Boito, R. Escribano, M. Jamin
EPIFANOV 07 PL B654 65	D. Epifanov <i>et al.</i> (BELLE Collab.)
ALAVI-HARATI 02B PRL 89 072001	A. Alavi-Harati <i>et al.</i> (FNAL KTeV Collab.)
BIRD 89 SLAC-332	P.F. Bird (SLAC)
ASTON 88 NP B296 493	D. Aston <i>et al.</i> (SLAC, NAGO, CINC, INUS)
ASTON 87 NP B292 693	D. Aston <i>et al.</i> (SLAC, NAGO, CINC, INUS)
ASTON 84 PL 149B 258	D. Aston <i>et al.</i> (SLAC, CARL, OTTA) JP
BAUBILLIER 82B NP B202 21	M. Baubillier <i>et al.</i> (BIRM, CERN, GLAS+)
ETKIN 80 PR D22 42	A. Etkin <i>et al.</i> (BNL, CUNY) JP

K₀* (1430)

$$I(J^P) = \frac{1}{2}(0^+)$$

See our minireview in the 1994 edition and in this edition under the $f_0(500)$.

K₀* (1430) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1425 ± 50 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1427 ± 4 ± 13	1 BUGG	10 RVUE			S-matrix pole
1466.6 ± 0.7 ± 3.4	2 BONVICINI 141k	08A CLEO	$D^+ \rightarrow K^- \pi^+ \pi^+$		
~ 1412	3 LINK	07 FOCS 0	$D^+ \rightarrow K^- K^+ \pi^+$		
1461.0 ± 4.0 ± 2.1	4 LINK 54k	07B FOCS	$D^+ \rightarrow K^- \pi^+ \pi^+$		
1406 ± 29	5 BUGG	06 RVUE			
1435 ± 6	6 ZHOU	06 RVUE	$Kp \rightarrow K^- \pi^+ n$		
1455 ± 20 ± 15	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$		
1456 ± 8	7 ZHENG	04 RVUE	$K^- p \rightarrow K^- \pi^+ n$		
~ 1419	8 BUGG	03 RVUE	11 $K^- p \rightarrow K^- \pi^+ n$		
~ 1440	9 LI	03 RVUE	11 $K^- p \rightarrow K^- \pi^+ n$		

NODE=M094215; NODE=M094

DESIG=2; OUR EST; → UNCHECKED ←
 DESIG=1
 DESIG=3; OUR EST; → UNCHECKED ←
 DESIG=4; OUR EST; → UNCHECKED ←

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NODE=M094W1
 NODE=M094W1

NODE=M094220

NODE=M094R1
 NODE=M094R1

NODE=M094R2
 NODE=M094R2

NODE=M094R3
 NODE=M094R3

NODE=M094

REFID=52728
 REFID=51929
 REFID=48822
 REFID=41002
 REFID=40262
 REFID=40234
 REFID=22689
 REFID=22551
 REFID=22545

NODE=M019

NODE=M019

NODE=M019M

NODE=M019M
 → UNCHECKED ←

1459 ± 9	15k	10 AITALA 11 JAMIN 12 BARBERIS	02 E791 00 RVUE 98E OMEG	$D^+ \rightarrow K^- \pi^+ \pi^+$ $Kp \rightarrow Kp$ $450 pp \rightarrow$ $p_f p_s K^+ K^- \pi^+ \pi^-$
1415 ± 25		8 ANISOVICH	97C RVUE	$11 K^- p \rightarrow K^- \pi^+ n$
~ 1450		13 TORNQVIST	96 RVUE	$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi$
1412 ± 6		14 ASTON	88 LASS 0	$11 K^- p \rightarrow K^- \pi^+ n$
~ 1430		BAUBILLIER	84B HBC -	$8.25 K^- p \rightarrow \bar{K}^0 \pi^- p$
~ 1425	15,16	ESTABROOKS	78 ASPK	$13 K^\pm p \rightarrow$ $K^\pm \pi^\pm(n, \Delta)$
~ 1450.0		MARTIN	78 SPEC	$10 K^\pm p \rightarrow K_S^0 \pi^\pm p$

1 S-Matrix pole. Supersedes BUGG 06. Combined analysis of ASTON 88, ABLIKIM 06C, AITALA 06, and LINK 09 using an s -dependent width with couplings to $K\pi$ and $K\eta'$, and the Adler zero near thresholds.

2 From the isobar model with a complex pole for the κ .

3 From a non-parametric analysis.

4 A Breit-Wigner mass and width.

5 S-matrix pole. Reanalysis of ASTON 88, AITALA 02, and ABLIKIM 06C including the κ with an s -dependent width and an Adler zero near threshold.

6 S-matrix pole. Using ASTON 88 and assuming $K_0^*(800)$, $K_0^*(1950)$.

7 Using ASTON 88 and assuming $K_0^*(800)$.

8 T-matrix pole. Reanalysis of ASTON 88 data.

9 Breit-Wigner fit. Using ASTON 88.

10 Assuming a low-mass scalar $K\pi$ resonance, $\kappa(800)$.

11 T-matrix pole. Using data from ESTABROOKS 78 and ASTON 88.

12 J^P not determined, could be $K_2^*(1430)$.

13 T-matrix pole.

14 Uses a model for the background, without this background they get a mass 1340 MeV, where the phase shift passes 90°.

15 Mass defined by pole position.

16 From elastic $K\pi$ partial-wave analysis.

NODE=M019M;LINKAGE=BG

NODE=M019M;LINKAGE=BO

NODE=M019M;LINKAGE=LI

NODE=M019M;LINKAGE=BW

NODE=M019M;LINKAGE=BU

NODE=M019M;LINKAGE=ZU

NODE=M019M;LINKAGE=ZH

NODE=M019M;LINKAGE=A1

NODE=M019M;LINKAGE=E

NODE=M019M;LINKAGE=A0

NODE=M019M;LINKAGE=JM

NODE=M019M;LINKAGE=JP

NODE=M019M;LINKAGE=TT

NODE=M019M;LINKAGE=D

NODE=M019M;LINKAGE=A

NODE=M019M;LINKAGE=C

$K_0^*(1430)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
270 ± 80 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
270 ± 10 ± 40	17 BUGG	10 RVUE			S-matrix pole
174.2 ± 1.9 ± 3.2	141k	18 BONVICINI	08A CLEO		$D^+ \rightarrow K^- \pi^+ \pi^+$
~ 500		19 LINK	07 FOCS 0		$D^+ \rightarrow K^- K^+ \pi^+$
177.0 ± 8.0 ± 3.4	54k	20 LINK	07B FOCS		$D^+ \rightarrow K^- \pi^+ \pi^+$
350 ± 40		21 BUGG	06 RVUE		
288 ± 22		22 ZHOU	06 RVUE		$Kp \rightarrow K^- \pi^+ n$
270 ± 45 ± 30		ABLIKIM	05Q BES2		$\psi(2S) \rightarrow$ $\gamma \pi^+ \pi^- K^+ K^-$
217 ± 31		23 ZHENG	04 RVUE		$K^- p \rightarrow K^- \pi^+ n$
~ 316		24 BUGG	03 RVUE		$11 K^- p \rightarrow K^- \pi^+ n$
~ 350		25 LI	03 RVUE		$11 K^- p \rightarrow K^- \pi^+ n$
175 ± 17	15k	26 AITALA	02 E791		$D^+ \rightarrow K^- \pi^+ \pi^+$
~ 300		27 JAMIN	00 RVUE		$Kp \rightarrow Kp$
196 ± 45		28 BARBERIS	98E OMEG		$450 pp \rightarrow$ $p_f p_s K^+ K^- \pi^+ \pi^-$
330 ± 50		24 ANISOVICH	97C RVUE		$11 K^- p \rightarrow K^- \pi^+ n$
~ 320		29 TORNQVIST	96 RVUE		$\pi\pi \rightarrow \pi\pi, K\bar{K}, K\pi$
294 ± 23		ASTON	88 LASS 0		$11 K^- p \rightarrow K^- \pi^+ n$
~ 200		BAUBILLIER	84B HBC -		$8.25 K^- p \rightarrow \bar{K}^0 \pi^- p$
200 to 300		30 ESTABROOKS	78 ASPK		$13 K^\pm p \rightarrow$ $K^\pm \pi^\pm(n, \Delta)$

17 S-Matrix pole. Supersedes BUGG 06. Combined analysis of ASTON 88, ABLIKIM 06C, AITALA 06, and LINK 09 using an s -dependent width with couplings to $K\pi$ and $K\eta'$, and the Adler zero near thresholds.

NODE=M019W;LINKAGE=BG

18 From the isobar model with a complex pole for the κ .

NODE=M019W;LINKAGE=BO

19 From a non-parametric analysis.

NODE=M019W;LINKAGE=LI

20 A Breit-Wigner mass and width.

NODE=M019W;LINKAGE=BW

21 S-matrix pole. Reanalysis of ASTON 88, AITALA 02, and ABLIKIM 06C including the κ with an s -dependent width and an Adler zero near threshold.

NODE=M019W;LINKAGE=BU

- 22 S-matrix pole. Using ASTON 88 and assuming $K_0^*(800)$, $K_0^*(1950)$.
 23 Using ASTON 88 and assuming $K_0^*(800)$.
 24 T-matrix pole. Reanalysis of ASTON 88 data.
 25 Breit-Wigner fit. Using ASTON 88.
 26 Assuming a low-mass scalar $K\pi$ resonance, $\kappa(800)$.
 27 T-matrix pole. Using data from ESTABROOKS 78 and ASTON 88.
 28 J^P not determined, could be $K_2^*(1430)$.
 29 T-matrix pole.
 30 From elastic $K\pi$ partial-wave analysis.

$K_0^*(1430)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\pi$	(93±10) %

$K_0^*(1430)$ BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	CHG	COMMENT	Γ_1/Γ
VALUE 0.93±0.04±0.09	ASTON	88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$

$K_0^*(1430)$ REFERENCES

BUGG	10	PR D81 014002	D.V. Bugg	(LOQM)
LINK	09	PL B681 14	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
BONVICINI	08A	PR D78 052001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
LINK	07	PL B648 156	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
LINK	07B	PL B653 1	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
ABLIKIM	06C	PL B633 681	M. Ablikim <i>et al.</i>	(BES Collab.)
AITALA	06	PR D73 032004	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
Also		PR D74 059901 (errat.)	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
BUGG	06	PL B632 471	D.V. Bugg	(LOQM)
ZHOU	06	NP A775 212	Z.Y. Zhou, H.Q. Zheng	
ABLIKIM	05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
ZHENG	04	NP A733 235	H.Q. Zheng <i>et al.</i>	
BUGG	03	PL B572 1	D.V. Bugg	
LI	03	PR D67 034025	L. Li, B. Zou, G. Li	
AITALA	02	PRL 89 121801	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
JAMIN	00	NP B587 331	M. Jamin <i>et al.</i>	
BARBERIS	98E	PL B436 204	D. Barberis <i>et al.</i>	(Omega Expt.)
ANISOVICH	97C	PL B413 137	A.V. Anisovich, A.V. Sarantsev	
TORNQVIST	96	PRL 76 1575	N.A. Tornqvist, M. Roos	(HELS)
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
BAUBILLIER	84B	ZPHY C26 37	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
ESTABROOKS	78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)
MARTIN	78	NP B134 392	A.D. Martin <i>et al.</i>	(DURH, GEVA)

NODE=M019W;LINKAGE=ZU
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 NODE=M019W;LINKAGE=A0
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 NODE=M019W;LINKAGE=JP
 NODE=M019W;LINKAGE=TT
 NODE=M019W;LINKAGE=C

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DESIG=1

NODE=M019220

NODE=M019R1
 NODE=M019R1

NODE=M019

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 REFID=48807
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 REFID=46348
 REFID=45815
 REFID=44507
 REFID=40262
 REFID=22459
 REFID=22443
 REFID=22446

NODE=M022

 $K_2^*(1430)$

$$I(J^P) = \frac{1}{2}(2^+)$$

We consider that phase-shift analyses provide more reliable determinations of the mass and width.

 $K_2^*(1430)$ MASS**CHARGED ONLY, WITH FINAL STATE $K\pi$**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1425.6 ± 1.5 OUR AVERAGE					Error includes scale factor of 1.1.
1420 \pm 4	1587	BAUBILLIER	84B	HBC	—
					$8.25 K^- p \rightarrow \bar{K}^0 \pi^- p$
1436 \pm 5.5	400	1,2 CLELAND	82	SPEC	+
1430 \pm 3.2	1500	1,2 CLELAND	82	SPEC	+
1430 \pm 3.2	1200	1,2 CLELAND	82	SPEC	—
1423 \pm 5	935	TOAFF	81	HBC	—
					$6.5 K^- p \rightarrow \bar{K}^0 \pi^- p$
1428.0 \pm 4.6		3 MARTIN	78	SPEC	+
1423.8 \pm 4.6		3 MARTIN	78	SPEC	—
1420.0 \pm 3.1	1400	AGUILAR-...	71B	HBC	—
1425 \pm 8.0	225	1,2 BARNHAM	71C	HBC	+
1416 \pm 10	220	CRENNELL	69D	DBC	—
1414 \pm 13.0	60	1 LIND	69	HBC	+
1427 \pm 12	63	1 SCHWEING...	68	HBC	—
1423 \pm 11.0	39	1 BASSANO	67	HBC	—
					$4.6-5.0 K^- p \rightarrow \bar{K}^0 \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1423.4 \pm 2 \pm 3	24809 \pm 820	4 BIRD	89	LASS	—
					$11 K^- p \rightarrow \bar{K}^0 \pi^- p$

NODE=M022205

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NODE=M022M1

OCCUR=2

OCCUR=3

OCCUR=2

OCCUR=2

NEUTRAL ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1432.4 ± 1.3 OUR AVERAGE				
1431.2 \pm 1.8 \pm 0.7		5 ASTON	88	LASS
1434 \pm 4 \pm 6		5 ASTON	87	LASS
1433 \pm 6 \pm 10		5 ASTON	84B	LASS
1471 \pm 12		5 BAUBILLIER	82B	HBC
1428 \pm 3		5 ASTON	81C	LASS
1434 \pm 2		5 ESTABROOKS	78	ASPK
1440 \pm 10		5 BOWLER	77	DBC
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1428.5 \pm 3.9	1786 \pm 127	6 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow K^{*0} K^\pm \pi^\mp \gamma$
1420 \pm 7	300	HENDRICK	76	DBC
1421.6 \pm 4.2	800	MCCUBBIN	75	HBC
1420.1 \pm 4.3		7 LINGLIN	73	HBC
1419.1 \pm 3.7	1800	AGUILAR-...	71B	HBC
1416 \pm 6	600	CORDS	71	DBC
1421.1 \pm 2.6	2200	DAVIS	69	HBC

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NODE=M022M4

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NODE=M022M;LINKAGE=W
NODE=M022M;LINKAGE=B
NODE=M022M;LINKAGE=F
NODE=M022M;LINKAGE=P
NODE=M022M4;LINKAGE=NS
NODE=M022M;LINKAGE=C

1 Errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.

2 Number of events in peak re-evaluated by us.

3 Systematic error added by us.

4 From a partial wave amplitude analysis.

5 From phase shift or partial-wave analysis.

6 Systematic errors not estimated.

7 From pole extrapolation, using world $K^+ p$ data summary tape.

$K_2^*(1430)$ WIDTH

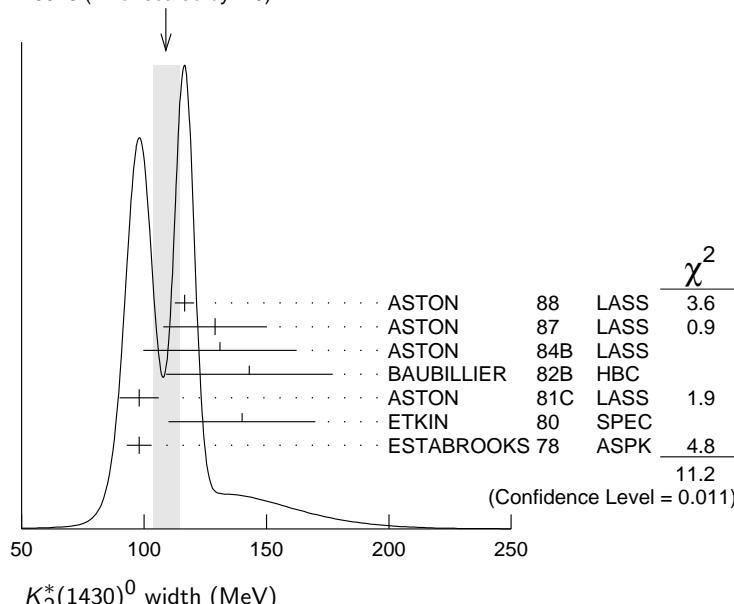
CHARGED ONLY, WITH FINAL STATE $K\pi$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
98.5 ± 2.7 OUR FIT					Error includes scale factor of 1.1.
98.5 ± 2.9 OUR AVERAGE					Error includes scale factor of 1.1.
109 ± 22	400	8,9 CLELAND	82 SPEC	+	$30 K^+ p \rightarrow K_S^0 \pi^+ p$
124 ± 12.8	1500	8,9 CLELAND	82 SPEC	+	$50 K^+ p \rightarrow K_S^0 \pi^+ p$
113 ± 12.8	1200	8,9 CLELAND	82 SPEC	-	$50 K^+ p \rightarrow K_S^0 \pi^- p$
85 ± 16	935	TOAFF	81 HBC	-	$6.5 K^- p \rightarrow \bar{K}^0 \pi^- p$
96.5 ± 3.8		MARTIN	78 SPEC	+	$10 K^\pm p \rightarrow K_S^0 \pi p$
97.7 ± 4.0		MARTIN	78 SPEC	-	$10 K^\pm p \rightarrow K_S^0 \pi p$
94.7 ± 15.1	1400	AGUILAR-...	71B HBC	-	$3.9, 4.6 K^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
98 ± 4 ± 4	25k	10 BIRD	89 LASS	-	$11 K^- p \rightarrow \bar{K}^0 \pi^- p$

NEUTRAL ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
109 ± 5 OUR AVERAGE				Error includes scale factor of 1.9. See the ideogram below.
116.5 ± 3.6 ± 1.7	11 ASTON	88 LASS	11	$K^- p \rightarrow K^- \pi^+ n$
129 ± 15 ± 15	11 ASTON	87 LASS	11	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
131 ± 24 ± 20	11 ASTON	84B LASS	11	$K^- p \rightarrow \bar{K}^0 2\pi n$
143 ± 34	11 BAUBILLIER	82B HBC	8.25	$K^- p \rightarrow N K_S^0 \pi \pi$
98 ± 8	11 ASTON	81C LASS	11	$K^- p \rightarrow K^- \pi^+ n$
140 ± 30	11 ETKIN	80 SPEC	6	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
98 ± 5	11 ESTABROOKS 78	ASPK	13	$K^\pm p \rightarrow p K \pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
113.7 ± 9.2	1786 ± 127	12 AUBERT BABR	07AK	$10.6 e^+ e^- \rightarrow K^{*0} K^\pm \pi^\mp \gamma$
125 ± 29	300	8 HENDRICK	76 DBC	$8.25 K^+ N \rightarrow K^+ \pi N$
116 ± 18	800	MCCUBBIN	75 HBC	$3.6 K^- p \rightarrow K^- \pi^+ n$
61 ± 14	13 LINGLIN	73 HBC	2-13	$K^+ p \rightarrow K^+ \pi^- X$
116.6 ± 10.3	1800	AGUILAR-...	71B HBC	$3.9, 4.6 K^- p$
144 ± 24.0	600	8 CORDS	71 DBC	$9 K^+ n \rightarrow K^+ \pi^- p$
101 ± 10	2200	DAVIS	69 HBC	$12 K^+ p \rightarrow K^+ \pi^- \pi^+ p$

WEIGHTED AVERAGE
109±5 (Error scaled by 1.9)



8 Errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

9 Number of events in peak re-evaluated by us.

10 From a partial wave amplitude analysis.

11 From phase shift or partial-wave analysis.

12 Systematic errors not estimated.

13 From pole extrapolation, using world $K^+ p$ data summary tape.

NODE=M022210

NODE=M022W1

NODE=M022W1

OCCUR=2

OCCUR=3

OCCUR=2

NODE=M022W4

NODE=M022W4

NODE=M022W;LINKAGE=D

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NODE=M022W;LINKAGE=F

NODE=M022W;LINKAGE=P

NODE=M022W4;LINKAGE=NS

NODE=M022W;LINKAGE=C

K₂^{*}(1430) DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 $K\pi$	(49.9±1.2) %	
Γ_2 $K^*(892)\pi$	(24.7±1.5) %	
Γ_3 $K^*(892)\pi\pi$	(13.4±2.2) %	
Γ_4 $K\rho$	(8.7±0.8) %	S=1.2
Γ_5 $K\omega$	(2.9±0.8) %	
Γ_6 $K^+\gamma$	(2.4±0.5) × 10 ⁻³	S=1.1
Γ_7 $K\eta$	(1.5 ^{+3.4} _{-1.0}) × 10 ⁻³	S=1.3
Γ_8 $K\omega\pi$	< 7.2 × 10 ⁻⁴	CL=95%
Γ_9 $K^0\gamma$	< 9 × 10 ⁻⁴	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and 10 branching ratios uses 31 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 20.2$ for 24 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	-9						
x_3	-40	-73					
x_4	-8	36	-52				
x_5	-11	-3	-26	-7			
x_6	-1	-1	-1	-1	0		
x_7	-4	-7	-5	-5	-2	0	
Γ	0	0	0	0	0	-13	0
	x_1	x_2	x_3	x_4	x_5	x_6	x_7

Mode	Rate (MeV)	Scale factor
Γ_1 $K\pi$	49.1 ± 1.8	
Γ_2 $K^*(892)\pi$	24.3 ± 1.6	
Γ_3 $K^*(892)\pi\pi$	13.2 ± 2.2	
Γ_4 $K\rho$	8.5 ± 0.8	1.2
Γ_5 $K\omega$	2.9 ± 0.8	
Γ_6 $K^+\gamma$	0.24 ± 0.05	1.1
Γ_7 $K\eta$	0.15 ^{+0.33} _{-0.10}	1.3

K₂^{*}(1430) PARTIAL WIDTHS

$\Gamma(K^+\gamma)$	Γ_6
VALUE (keV)	DOCUMENT ID TECN CHG COMMENT
241±50 OUR FIT	Error includes scale factor of 1.1.
240±45	CIHANGIR 82 SPEC + 200 $K^+ Z \rightarrow Z K^+ \pi^0$, $Z K_S^0 \pi^+$

NODE=M022220

NODE=M022W8
NODE=M022W9

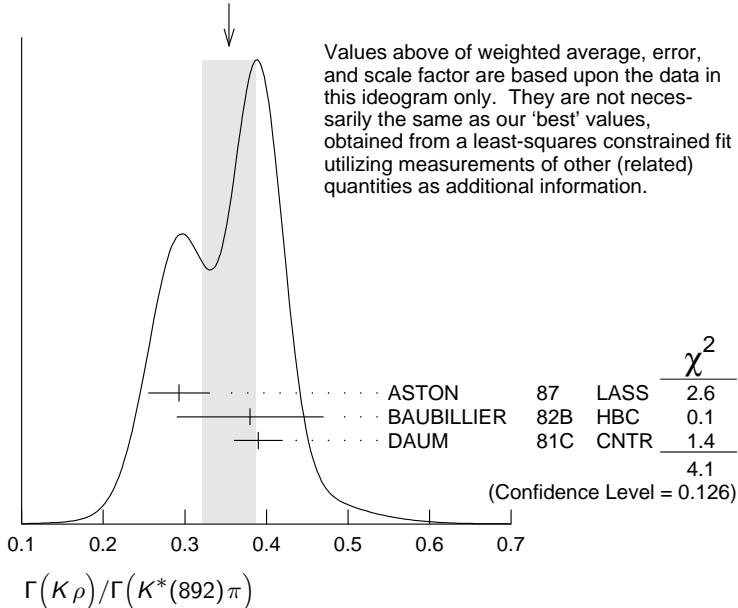
$\Gamma(K^0\gamma)$	Γ_9
VALUE (keV)	CL% DOCUMENT ID TECN CHG COMMENT
< 5.4	90 ALAVI-HARATI02B KTEV $K + A \rightarrow K^* + A$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<84	90 CARLSMITH 87 SPEC 0 60–200 $K_L^0 A \rightarrow K_S^0 \pi^0 A$

NODE=M022W9
NODE=M022W9

K*(1430) BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
0.499±0.012 OUR FIT	
0.488±0.014 OUR AVERAGE	
0.485±0.006±0.020 ¹⁴ ASTON 88 LASS 0 11 $K^- p \rightarrow K^-\pi^+ n$	
0.49 ± 0.02 ¹⁴ ESTABROOKS 78 ASPK ± 13 $K^\pm p \rightarrow p K\pi$	
$\Gamma(K^*(892)\pi)/\Gamma(K\pi)$	Γ_2/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
0.496±0.034 OUR FIT	
0.47 ± 0.04 OUR AVERAGE	
0.44 ± 0.09 ASTON 84B LASS 0 11 $K^- p \rightarrow \bar{K}^0 2\pi n$	
0.62 ± 0.19 LAUSCHER 75 HBC 0 10,16 $K^- p \rightarrow K^-\pi^+ n$	
0.54 ± 0.16 DEHM 74 DBC 0 4.6 $K^+ N$	
0.47 ± 0.08 AGUILAR-... 71B HBC 3.9,4.6 $K^- p$	
0.47 ± 0.10 BASSANO 67 HBC -0 4.6,5.0 $K^- p$	
0.45 ± 0.13 BADIER 65C HBC - 3 $K^- p$	
$\Gamma(K\omega)/\Gamma(K\pi)$	Γ_5/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
0.059±0.017 OUR FIT	
0.070±0.035 OUR AVERAGE	
0.05 ± 0.04 AGUILAR-... 71B HBC 3.9,4.6 $K^- p$	
0.13 ± 0.07 BASSOMPIE... 69 HBC 0 5 $K^+ p$	
$\Gamma(K\rho)/\Gamma(K\pi)$	Γ_4/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
0.174±0.017 OUR FIT	Error includes scale factor of 1.2.
0.150^{+0.029}_{-0.017} OUR AVERAGE	
0.18 ± 0.05 ASTON 84B LASS 0 11 $K^- p \rightarrow \bar{K}^0 2\pi n$	
0.02 ^{+0.10} _{-0.02} DEHM 74 DBC 0 4.6 $K^+ N$	
0.16 ± 0.05 AGUILAR-... 71B HBC 3.9,4.6 $K^- p$	
0.14 ± 0.10 BASSANO 67 HBC -0 4.6,5.0 $K^- p$	
0.14 ± 0.07 BADIER 65C HBC - 3 $K^- p$	
$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$	Γ_4/Γ_2
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
0.350±0.031 OUR FIT	Error includes scale factor of 1.4.
0.354±0.033 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.
0.293±0.032±0.020 ASTON 87 LASS 0 11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$	
0.38 ± 0.09 BAUBILLIER 82B HBC 0 8.25 $K^- p \rightarrow NK_S^0 \pi\pi$	
0.39 ± 0.03 DAUM 81C CNTR 63 $K^- p \rightarrow K^- 2\pi p$	

WEIGHTED AVERAGE
 0.354 ± 0.033 (Error scaled by 1.4)



NODE=M022225

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NODE=M022R1NODE=M022R4
NODE=M022R4NODE=M022R5
NODE=M022R5

OCCUR=2

NODE=M022R6
NODE=M022R6NODE=M022R7
NODE=M022R7

$\Gamma(K\omega)/\Gamma(K^*(892)\pi)$						Γ_5/Γ_2	NODE=M022R8 NODE=M022R8
VALUE	DOCUMENT ID	TECN	CHG	COMMENT			
0.118±0.034 OUR FIT							
0.10 ±0.04	FIELD	67	HBC	—	3.8 $K^- p$		
$\Gamma(K\eta)/\Gamma(K^*(892)\pi)$						Γ_7/Γ_2	NODE=M022R9 NODE=M022R9
VALUE	DOCUMENT ID	TECN	CHG	COMMENT			
0.006+0.014 -0.004 OUR FIT	Error includes scale factor of 1.2.						
0.07 ±0.04	FIELD	67	HBC	—	3.8 $K^- p$		
$\Gamma(K\eta)/\Gamma(K\pi)$						Γ_7/Γ_1	NODE=M022R10 NODE=M022R10
VALUE	CL %	DOCUMENT ID	TECN	CHG	COMMENT		
0.0030+0.0070 -0.0020 OUR FIT	Error includes scale factor of 1.3.						
0 ±0.0056	15 ASTON	88B LASS	—	11 $K^- p \rightarrow K^- \eta p$			
• • • We do not use the following data for averages, fits, limits, etc. • • •							
<0.04	95 AGUILAR...	71B HBC		3.9,4.6 $K^- p$			
<0.065	16 BASSOMPIE...	69 HBC		5.0 $K^+ p$			
<0.02	BISHOP	69 HBC		3.5 $K^+ p$			
$\Gamma(K^*(892)\pi\pi)/\Gamma_{\text{total}}$						Γ_3/Γ	NODE=M022R11 NODE=M022R11
VALUE	DOCUMENT ID	TECN	CHG	COMMENT			
0.134±0.022 OUR FIT							
0.12 ±0.04	17 GOLDBERG	76 HBC	—	3 $K^- p \rightarrow p\bar{K}^0 \pi\pi\pi$			
$\Gamma(K^*(892)\pi\pi)/\Gamma(K\pi)$						Γ_3/Γ_1	NODE=M022R12 NODE=M022R12
VALUE	DOCUMENT ID	TECN	CHG	COMMENT			
0.27±0.05 OUR FIT							
0.21±0.08	16,17 JONGEJANS	78 HBC	—	4 $K^- p \rightarrow p\bar{K}^0 \pi\pi\pi$			
$\Gamma(K\omega\pi)/\Gamma_{\text{total}}$						Γ_8/Γ	NODE=M022R13 NODE=M022R13
VALUE (units 10^{-3})	CL %	EVTS	DOCUMENT ID	TECN	COMMENT		
<0.72	95	0	JONGEJANS	78 HBC	4 $K^- p \rightarrow p\bar{K}^0 4\pi$		
14 From phase shift analysis.							
15 ASTON 88B quote < 0.0092 at CL=95%. We convert this to a central value and 1 sigma error in order to be able to use it in our constrained fit.							
16 Restated by us.							
17 Assuming $\pi\pi$ system has isospin 1, which is supported by the data.							
$K^*(1430)$ REFERENCES							
AUBERT 07AK PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)					
ALAVI-HARATI 02B PRL 89 072001	A. Alavi-Harati <i>et al.</i>	(FNAL KTeV Collab.)					
BIRD 89 SLAC-332	P.F. Bird	(SLAC)					
ASTON 88 NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)					
ASTON 88B PL B201 169	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)					
ASTON 87 NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)					
CARLSMITH 87 PR D36 3502	D. Carlsmith <i>et al.</i>	(EFI, SACL)					
ASTON 84B NP B247 261	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA)					
BAUBILLIER 84B ZPHY C26 37	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)					
BAUBILLIER 82B NP B202 21	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)					
CIHANGIR 82 PL 117B 123	S. Cihangir <i>et al.</i>	(FNAL, MINN, ROCH)					
CLELAND 82 NP B208 189	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)					
ASTON 81C PL 106B 235	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP					
DAUM 81C NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)					
TOAFF 81 PR D23 1500	S. Toaff <i>et al.</i>	(ANL, KANS)					
ETKIN 80 PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP					
ESTABROOKS 78 NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)					
Also PR D17 658	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)					
JONGEJANS 78 NP B139 383	B. Jongejans <i>et al.</i>	(ZEEM, CERN, NIJM+)					
MARTIN 78 NP B134 392	A.D. Martin <i>et al.</i>	(DURH, GEVA)					
BOWLER 77 NP B126 31	M.G. Bowler <i>et al.</i>	(OXF)					
GOLDBERG 76 LNC 17 253	J. Goldberg	(HAIF)					
HENDRICK 76 NP B112 189	K. Hendrickx <i>et al.</i>	(MONS, SACL, PARIS+)					
LAUSCHER 75 NP B86 189	P. Lauscher <i>et al.</i>	(ABCLV Collab.) JP					
MCCUBBIN 75 NP B86 13	N.A. McCubbin, L. Lyons	(OXF)					
DEHM 74 NP B75 47	G. Dehm <i>et al.</i>	(MPIM, BRUX, MONS, CERN)					
LINGLIN 73 NP B55 408	D. Linglin	(CERN)					
AGUILAR-BENITEZ 71B PR D4 2583	M. Aguilar-Benitez, R.L. Eisner, J.B. Kinson	(BNL)					
BARNHAM 71C NP B28 171	K.W.J. Barnham <i>et al.</i>	(BIRM, GLAS)					
CORDS 71 PR D4 1974	D. Cords <i>et al.</i>	(PURD, UCD, IUPU)					
BASSOMPIE... 69 NP B13 189	G. Bassompierre <i>et al.</i>	(CERN, BRUX) JP					
BISHOP 69 NP B9 403	J.M. Bishop <i>et al.</i>	(WISC)					
CRENNELL 69D PRL 22 487	D.J. Crennell <i>et al.</i>	(BNL)					
DAVIS 69 PRL 23 1071	P.J. Davis <i>et al.</i>	(LRL)					
LIND 69 NP B14 1	V.G. Lind <i>et al.</i>	(LRL) JP					
SCHWEINGRUBER... 68 PR 166 1317	F. Schweingruber <i>et al.</i>	(ANL, NWES)					
Also Thesis	F.L. Schweingruber	(NWES, NWES)					
BASSANO 67 PRL 19 968	D. Bassano <i>et al.</i>	(BNL, SYRA)					
FIELD 67 PL 24B 638	J.H. Field <i>et al.</i>	(UCSD)					
BADIER 65C PL 19 612	J. Badier <i>et al.</i>	(EPOL, SACL, AMST)					

K(1460) $I(J^P) = \frac{1}{2}(0^-)$

OMMITTED FROM SUMMARY TABLE
Observed in $K\pi\pi$ partial-wave analysis.

K(1460) MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~1460	DAUM	81C	CNTR	—
~1400	¹ BRANDENB...	76B	ASPK	±
¹ Coupled mainly to $Kf_0(1370)$. Decay into $K^*(892)\pi$ seen.				

K(1460) WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~260	DAUM	81C	CNTR	—
~250	² BRANDENB...	76B	ASPK	±
² Coupled mainly to $Kf_0(1370)$. Decay into $K^*(892)\pi$ seen.				

K(1460) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K^*(892)\pi$	seen
$\Gamma_2 K\rho$	seen
$\Gamma_3 K_0^*(1430)\pi$	seen

K(1460) PARTIAL WIDTHS **$\Gamma(K^*(892)\pi)$**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~109	DAUM	81C	CNTR 63 $K^- p \rightarrow K^- 2\pi p$

 Γ_1

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~34	DAUM	81C	CNTR 63 $K^- p \rightarrow K^- 2\pi p$

 Γ_2

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~117	DAUM	81C	CNTR 63 $K^- p \rightarrow K^- 2\pi p$

 Γ_3

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
DAUM	81C	NP B187 1	C. Daum <i>et al.</i> (AMST, CERN, CRAC, MPIM+)

BRANDENB... 76B PRL 36 1239 G.W. Brandenburg *et al.* (SLAC) JP

NODE=M021

NODE=M021M

NODE=M021M

NODE=M021M;LINKAGE=A

NODE=M021W

NODE=M021W

NODE=M021W;LINKAGE=A

NODE=M021215;NODE=M021

DESIG=1;OUR EST;→ UNCHECKED ←
DESIG=2;OUR EST;→ UNCHECKED ←
DESIG=3;OUR EST;→ UNCHECKED ←

NODE=M021220

NODE=M021W1
NODE=M021W1NODE=M021W2
NODE=M021W2NODE=M021W3
NODE=M021W3

NODE=M021

REFID=22548
REFID=22767

$K_2(1580)$

$$I(J^P) = \frac{1}{2}(2^-)$$

OMITTED FROM SUMMARY TABLE

Seen in partial-wave analysis of the $K^- \pi^+ \pi^-$ system. Needs confirmation.

NODE=M039

 $K_2(1580)$ MASS

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~ 1580	OTTER	79	— 10,14,16 $K^- p$

NODE=M039

NODE=M039M

NODE=M039M

 $K_2(1580)$ WIDTH

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~ 110	OTTER	79	— 10,14,16 $K^- p$

NODE=M039W

NODE=M039W

 $K_2(1580)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K^*(892)\pi$	seen
$\Gamma_2 K_2^*(1430)\pi$	possibly seen

NODE=M039215; NODE=M039

DESIG=1

DESIG=2

 $K_2(1580)$ BRANCHING RATIOS

$\Gamma(K^*(892)\pi)/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
seen OTTER 79 HBC — 10,14,16 $K^- p$	
• • • We do not use the following data for averages, fits, limits, etc. • • •	
possibly seen	GULER 11 BELL $B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$
$\Gamma(K_2^*(1430)\pi)/\Gamma_{\text{total}}$	Γ_2/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>
possibly seen OTTER 79 HBC — 10,14,16 $K^- p$	

NODE=M039220

NODE=M039R1

NODE=M039R1

NODE=M039R2

NODE=M039R2

 $K_2(1580)$ REFERENCES

GULER	11	PR D83 032005	H. Guler <i>et al.</i>	(BELLE Collab.)
OTTER	79	NP B147 1	G. Otter <i>et al.</i>	(AACH3, BERL, CERN, LOIC+) JP

NODE=M039

REFID=53668

REFID=22772

K(1630)

$I(J^P) = \frac{1}{2}(?)$

OMITTED FROM SUMMARY TABLE

Seen as a narrow peak, compatible with the experimental resolution, in the invariant mass of the $K_S^0\pi^+\pi^-$ system produced in π^-p interactions at high momentum transfers.

NODE=M160

K(1630) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1629±7	~ 75	KARNAUKHOV98	BC	16.0 $\pi^-p \rightarrow (K_S^0\pi^+\pi^-) X^+\pi^-X^0$

NODE=M160M

NODE=M160M

K(1630) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
16⁺¹⁹₋₁₆	~ 75	¹ KARNAUKHOV98	BC	16.0 $\pi^-p \rightarrow (K_S^0\pi^+\pi^-) X^+\pi^-X^0$

NODE=M160W

NODE=M160W

¹ Compatible with an experimental resolution of 14 ± 1 MeV.

NODE=M160W;LINKAGE=A

K(1630) DECAY MODES

Mode
$\Gamma_1 K_S^0\pi^+\pi^-$

DESIG=1

K(1630) REFERENCES

KARNAUKHOV 98 PAN 61 203 V.M. Karnaughov, C. Coca, V.I. Moroz
Translated from YAF 61 252.

NODE=M160

REFID=46371

NODE=M099

K₁(1650)

$I(J^P) = \frac{1}{2}(1^+)$

OMITTED FROM SUMMARY TABLE

This entry contains various peaks in strange meson systems ($K^+\phi$, $K\pi\pi$) reported in partial-wave analysis in the 1600–1900 mass region.

NODE=M099

K₁(1650) MASS

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
1650±50	FRAME 86 OMEG +	86	OMEG +	13 $K^+p \rightarrow \phi K^+p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 1840	ARMSTRONG 83 OMEG -	83	OMEG -	18.5 $K^-p \rightarrow 3Kp$
~ 1800	DAUM 81C CNTR -	81C	CNTR -	63 $K^-p \rightarrow K^-2\pi p$

NODE=M099M

NODE=M099M

K₁(1650) WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
150±50	FRAME 86 OMEG +	86	OMEG +	13 $K^+p \rightarrow \phi K^+p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 250	DAUM 81C CNTR -	81C	CNTR -	63 $K^-p \rightarrow K^-2\pi p$

NODE=M099W

NODE=M099W

K₁(1650) DECAY MODES

Mode
$\Gamma_1 K\pi\pi$
$\Gamma_2 K\phi$

NODE=M099215;NODE=M099

DESIG=1

DESIG=2

K₁(1650) REFERENCES

FRAME	86	NP B276 667	D. Frame <i>et al.</i>	(GLAS)
ARMSTRONG	83	NP B221 1	T.A. Armstrong <i>et al.</i>	(BARI, BIRM, CERN+)
DAUM	81C	NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)

NODE=M099

REFID=20569
REFID=22801
REFID=22548

NODE=M095

K^{*}(1680)

$$I(J^P) = \frac{1}{2}(1^-)$$

K^{*}(1680) MASS

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
1717±27 OUR AVERAGE				Error includes scale factor of 1.4.
1677±10±32	ASTON 88	LASS 0	11	$K^- p \rightarrow K^- \pi^+ n$
1735±10±20	ASTON 87	LASS 0	11	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1678±64	BIRD 89	LASS —	11	$K^- p \rightarrow \bar{K}^0 \pi^- p$
1800±70	ETKIN 80	MPS 0	6	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
~1650	ESTABROOKS 78	ASPK 0	13	$K^\pm p \rightarrow K^\pm \pi^\pm n$

NODE=M095M

NODE=M095M

K^{*}(1680) WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
322±110 OUR AVERAGE				Error includes scale factor of 4.2.
205± 16±34	ASTON 88	LASS 0	11	$K^- p \rightarrow K^- \pi^+ n$
423± 18±30	ASTON 87	LASS 0	11	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
454±270	BIRD 89	LASS —	11	$K^- p \rightarrow \bar{K}^0 \pi^- p$
170± 30	ETKIN 80	MPS 0	6	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
250 to 300	ESTABROOKS 78	ASPK 0	13	$K^\pm p \rightarrow K^\pm \pi^\pm n$

NODE=M095W

NODE=M095W

K^{*}(1680) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\pi$	(38.7±2.5) %
$\Gamma_2 K\rho$	(31.4 ^{+5.0} _{-2.1}) %
$\Gamma_3 K^*(892)\pi$	(29.9 ^{+2.2} _{-5.0}) %

NODE=M095215; NODE=M095

DESIG=1

DESIG=3

DESIG=2

CONSTRAINED FIT INFORMATION

An overall fit to 4 branching ratios uses 4 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 2.9$ for 2 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|cc} & -36 & \\ x_2 & -39 & -72 \\ \hline x_3 & & \\ & x_1 & x_2 \end{array}$$

K^{*}(1680) BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	CHG	COMMENT	Γ_1/Γ
0.397±0.026 OUR FIT					
0.388±0.014±0.022	ASTON 88	LASS 0	11	$K^- p \rightarrow K^- \pi^+ n$	

NODE=M095220

NODE=M095R4
NODE=M095R4

$\Gamma(K\pi)/\Gamma(K^*(892)\pi)$						Γ_1/Γ_3
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>		
$1.30^{+0.23}_{-0.14}$ OUR FIT						
2.8 ± 1.1	ASTON	84	LASS	0	$11 K^- p \rightarrow \bar{K}^0 2\pi n$	
$\Gamma(K\rho)/\Gamma(K\pi)$						Γ_2/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>		
$0.81^{+0.14}_{-0.09}$ OUR FIT						
1.2 ± 0.4	ASTON	84	LASS	0	$11 K^- p \rightarrow \bar{K}^0 2\pi n$	
$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$						Γ_2/Γ_3
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>		
$1.05^{+0.27}_{-0.11}$ OUR FIT						
$0.97 \pm 0.09^{+0.30}_{-0.10}$	ASTON	87	LASS	0	$11 K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$	

K*(1680) REFERENCES

BIRD 89	SLAC-332	P.F. Bird	(SLAC)
ASTON 88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON 87	NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON 84	PL 149B 258	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP
ETKIN 80	PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP
ESTABROOKS 78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+) JP

$K_2(1770)$

$$I(J^P) = \frac{1}{2}(2^-)$$

See our mini-review in the 2004 edition of this *Review*, PDG 04.

$K_2(1770)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
1773 ± 8		¹ ASTON	93	LASS	$11 K^- p \rightarrow K^- \omega p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1743 \pm 15		TIKHOMIROV 03	SPEC		$40.0 \pi^- \overset{\circ}{C} \rightarrow K_S^0 K_S^0 K_L^0 X$
1810 \pm 20		FRAME 86	OMEG +		$13 K^+ p \rightarrow \phi K^+ p$
~ 1730		ARMSTRONG 83	OMEG -		$18.5 K^- p \rightarrow 3K p$
~ 1780		² DAUM 81C	CNTR -		$63 K^- p \rightarrow K^- 2\pi p$
1710 \pm 15	60	CHUNG 74	HBC -		$7.3 K^- p \rightarrow K^- \omega p$
1767 \pm 6		BLIEDEN 72	MMS -		$11\text{--}16 K^- p$
1730 \pm 20	306	³ FIRESTONE 72B	DBC +		$12 K^+ d$
1765 \pm 40		COLLEY 71	HBC +		$10 K^+ p \rightarrow K 2\pi N$
1740		DENEGRIG 71	DBC -		$12.6 K^- d \rightarrow \bar{K} 2\pi d$
1745 \pm 20		AGUILAR-...	70C HBC -		$4.6 K^- p$
1780 \pm 15		BARTSCH 70C	HBC -		$10.1 K^- p$
1760 \pm 15		LUDLAM 70	HBC -		$12.6 K^- p$

¹ From a partial wave analysis of the $K^- \omega$ system.

² From a partial wave analysis of the $K^- 2\pi$ system.

³ Produced in conjunction with excited deuteron.

⁴ Systematic errors added correspond to spread of different fits.

NODE=M095

REFID=41002
REFID=40262
REFID=40234
REFID=22689
REFID=22545
REFID=22443

NODE=M023

NODE=M023

NODE=M023M

NODE=M023M

NODE=M023M;LINKAGE=A
NODE=M023M;LINKAGE=B
NODE=M023M;LINKAGE=P
NODE=M023M;LINKAGE=X

NODE=M023W

NODE=M023W

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
186 ± 14		⁵ ASTON	93	LASS	$11 K^- p \rightarrow K^- \omega p$

• • • We do not use the following data for averages, fits, limits, etc. • • •

147±70	TIKHOMIROV 03	SPEC	40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
140±40	FRAME	86	OMEG + 13 $K^+ p \rightarrow \phi K^+ p$
~220	ARMSTRONG	83	OMEG - 18.5 $K^- p \rightarrow 3K p$
~210	⁶ DAUM	81C	CNTR - 63 $K^- p \rightarrow K^- 2\pi p$
110±50	CHUNG	74	HBC - 7.3 $K^- p \rightarrow K^- \omega p$
100±26	BLIEDEN	72	MMS - 11–16 $K^- p$
210±30	⁷ FIRESTONE	72B	DBC + 12 $K^+ d$
90±70	⁸ COLLEY	71	HBC + 10 $K^+ p \rightarrow K 2\pi N$
130	DENEGRIGR	71	DBC - 12.6 $K^- d \rightarrow \bar{K} 2\pi d$
100±50	AGUILAR-...	70C	HBC - 4.6 $K^- p$
138±40	BARTSCH	70C	HBC - 10.1 $K^- p$
50 ⁺⁴⁰ ₋₂₀	LUDLAM	70	HBC - 12.6 $K^- p$

⁵ From a partial wave analysis of the $K^- \omega$ system.

⁶ From a partial wave analysis of the $K^- 2\pi$ system.

⁷ Produced in conjunction with excited deuteron.

⁸ Systematic errors added correspond to spread of different fits.

NODE=M023W;LINKAGE=B

NODE=M023W;LINKAGE=C

NODE=M023W;LINKAGE=P

NODE=M023W;LINKAGE=X

NODE=M023215;NODE=M023

K₂(1770) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K \pi \pi$	
$\Gamma_2 K_2^*(1430)\pi$	dominant
$\Gamma_3 K^*(892)\pi$	seen
$\Gamma_4 K f_2(1270)$	seen
$\Gamma_5 K f_0(980)$	
$\Gamma_6 K \phi$	seen
$\Gamma_7 K \omega$	seen

K₂(1770) BRANCHING RATIOS

$$\Gamma(K_2^*(1430)\pi)/\Gamma(K\pi\pi) \quad \Gamma_2/\Gamma_1$$

$(K_2^*(1430) \rightarrow K\pi)$

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~0.03	DAUM	81C	CNTR	63 $K^- p \rightarrow K^- 2\pi p$
~1.0	⁹ FIRESTONE	72B	DBC	+ 12 $K^+ d$
<1.0	COLLEY	71	HBC	10 $K^+ p$
0.2 ±0.2	AGUILAR-...	70C	HBC	- 4.6 $K^- p$
<1.0	BARTSCH	70C	HBC	- 10.1 $K^- p$
1.0	BARBARO-...	69	HBC	+ 12.0 $K^+ p$

⁹ Produced in conjunction with excited deuteron.

NODE=M023220

NODE=M023R1

NODE=M023R1

NODE=M023R1

$$\Gamma(K^*(892)\pi)/\Gamma(K\pi\pi) \quad \Gamma_3/\Gamma_1$$

VALUE DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •			
~0.23	DAUM	81C	CNTR 63 $K^- p \rightarrow K^- 2\pi p$

NODE=M023R1;LINKAGE=P

NODE=M023R3

NODE=M023R3

$$\Gamma(K f_2(1270))/\Gamma(K\pi\pi) \quad \Gamma_4/\Gamma_1$$

$(f_2(1270) \rightarrow \pi\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~0.74	DAUM	81C	CNTR 63 $K^- p \rightarrow K^- 2\pi p$

NODE=M023R4

NODE=M023R4

NODE=M023R4

$$\Gamma(K f_0(980))/\Gamma_{\text{total}} \quad \Gamma_5/\Gamma$$

VALUE DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •			
possibly seen	TIKHOMIROV 03	SPEC	40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$

NODE=M023R6

NODE=M023R6

$\Gamma(K\phi)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
seen	ARMSTRONG 83	OMEG	-	$18.5 K^- p \rightarrow K^- \phi N$	
$\Gamma(K\omega)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE	DOCUMENT ID	TECN	CHG	COMMENT	
seen	OTTER 81	HBC	\pm	$8.25, 10, 16 K^\pm p$	
seen	CHUNG 74	HBC	-	$7.3 K^- p \rightarrow K^- \omega p$	

K₂(1770) REFERENCES

PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)
TIKHOMIROV	03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>	
		Translated from YAF 66 860		
ASTON	93	PL B308 186	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
FRAME	86	NP B276 667	D. Frame <i>et al.</i>	(GLAS)
ARMSTRONG	83	NP B221 1	T.A. Armstrong <i>et al.</i>	(BARI, BIRM, CERN+)
DAUM	81C	NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)
OTTER	81	NP B181 1	G. Otter	(AACH3, BERL, LOIC, VIEN, BIRM+)
CHUNG	74	PL 51B 413	S.U. Chung <i>et al.</i>	(BNL)
BLIEDEN	72	PL 39B 668	H.R. Blieden <i>et al.</i>	(STON, NEAS)
FIRESTONE	72B	PR D5 505	A. Firestone <i>et al.</i>	(LBL)
COLLEY	71	NP B26 71	D.C. Colley <i>et al.</i>	(BIRM, GLAS)
DENEGR	71	NP B28 13	D. Denegri <i>et al.</i>	(JHU) JP
AGUILAR-	70C	PRL 25 54	M. Aguilar-Benitez <i>et al.</i>	(BNL)
BARTSCH	70C	PL 33B 186	J. Bartsch <i>et al.</i>	(AACH, BERL, CERN+)
LUDLAM	70	PR D2 1234	T. Ludlam, J. Sandweiss, A.J. Slaughter	(YALE)
BARBARO-	69	PRL 22 1207	A. Barbaro-Galtieri <i>et al.</i>	(LRL)

$K_3^*(1780)$

$$I(J^P) = \frac{1}{2}(3^-)$$

$K_3^*(1780)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1776 \pm 7 OUR AVERAGE		Error includes scale factor of 1.1.			
1781 \pm 8 \pm 4		¹ ASTON 88 LASS 0			$11 K^- p \rightarrow K^- \pi^+ n$
1740 \pm 14 \pm 15		¹ ASTON 87 LASS 0			$11 K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1779 \pm 11		² BALDI 76 SPEC +			$10 K^+ p \rightarrow K^0 \pi^+ p$
1776 \pm 26		³ BRANDENB... 76D ASPK 0			$13 K^\pm p \rightarrow K^\pm \pi^\mp N$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1720 \pm 10 \pm 15	6111	⁴ BIRD 89 LASS -			$11 K^- p \rightarrow \bar{K}^0 \pi^- p$
1749 \pm 10		ASTON 88B LASS -			$11 K^- p \rightarrow K^- \eta p$
1780 \pm 9	300	BAUBILLIER 84B HBC -			$8.25 K^- p \rightarrow \bar{K}^0 \pi^- p$
		BAUBILLIER 82B HBC 0			$8.25 K^- p \rightarrow K_S^0 2\pi N$
1784 \pm 9	2060	CLELAND 82 SPEC \pm			$50 K^+ p \rightarrow K_S^0 \pi^\pm p$
1786 \pm 15		⁵ ASTON 81D LASS 0			$11 K^- p \rightarrow K^- \pi^+ n$
1762 \pm 9	190	TOAFF 81 HBC -			$6.5 K^- p \rightarrow \bar{K}^0 \pi^- p$
1850 \pm 50		ETKIN 80 MPS 0			$6 K^- p \rightarrow \bar{K}^0 \pi^+ \pi^-$
1812 \pm 28		BEUSCH 78 OMEG			$10 K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1786 \pm 8		CHUNG 78 MPS 0			$6 K^- p \rightarrow K^- \pi^+ n$

1 From energy-independent partial-wave analysis.

2 From a fit to Y_6^2 moment. $J^P = 3^-$ found.

3 Confirmed by phase shift analysis of ESTABROOKS 78, yields $J^P = 3^-$.

4 From a partial wave amplitude analysis.

5 From a fit to the Y_6^0 moment.

NODE=M023R5
NODE=M023R5

NODE=M023R2
NODE=M023R2

NODE=M023

REFID=49653
REFID=49423

REFID=43597

REFID=20569

REFID=22801

REFID=22548

REFID=22549

REFID=22735

REFID=22788

REFID=22506

REFID=22785

REFID=22497

REFID=22782

REFID=22783

REFID=22784

REFID=22483

NODE=M060

NODE=M060M

NODE=M060M

NODE=M060M;LINKAGE=K

NODE=M060M;LINKAGE=M

NODE=M060M;LINKAGE=A

NODE=M060M;LINKAGE=F

NODE=M060M;LINKAGE=J

NODE=M060W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
159±21 OUR AVERAGE					Error includes scale factor of 1.3. See the ideogram below.
203±30± 8		6 ASTON	88 LASS	0	$K^- p \rightarrow K^- \pi^+ n$
171±42±20		6 ASTON	87 LASS	0	$K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
135±22		7 BALDI	76 SPEC	+	$K^+ p \rightarrow K^0 \pi^+ p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
187±31±20	6111	8 BIRD	89 LASS	-	$K^- p \rightarrow \bar{K}^0 \pi^- p$
193^{+51}_{-37}		ASTON	88B LASS	-	$K^- p \rightarrow K^- \eta p$
99±30	300	BAUBILLIER	84B HBC	-	$8.25 K^- p \rightarrow \bar{K}^0 \pi^- p$
~ 130		BAUBILLIER	82B HBC	0	$8.25 K^- p \rightarrow K_S^0 2\pi N$
191±24	2060	CLELAND	82 SPEC	±	$50 K^+ p \rightarrow K_S^0 \pi^\pm p$
225±60		9 ASTON	81D LASS	0	$K^- p \rightarrow K^- \pi^+ n$
~ 80	190	TOAFF	81 HBC	-	$6.5 K^- p \rightarrow \bar{K}^0 \pi^- p$
240±50		ETKIN	80 MPS	0	$6 K^- p \rightarrow \bar{K}^0 \pi^+ \pi^-$
181±44		10 BEUSCH	78 OMEG		$10 K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
96±31		CHUNG	78 MPS	0	$6 K^- p \rightarrow K^- \pi^+ n$
270±70		11 BRANDENB...	76D ASPK	0	$13 K^\pm p \rightarrow K^\pm \pi^\mp N$

6 From energy-independent partial-wave analysis.

7 From a fit to Y_6^2 moment. $J^P = 3^-$ found.

8 From a partial wave amplitude analysis.

9 From a fit to Y_6^0 moment.

10 Errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

11 ESTABROOKS 78 find that BRANDENBURG 76D data are consistent with 175 MeV width. Not averaged.

NODE=M060W

NODE=M060W;LINKAGE=K

NODE=M060W;LINKAGE=M

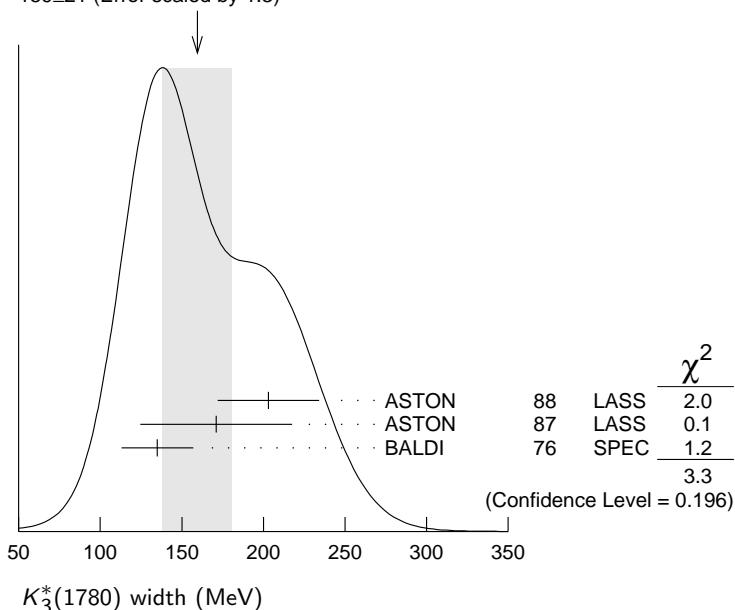
NODE=M060W;LINKAGE=F

NODE=M060W;LINKAGE=J

NODE=M060W;LINKAGE=D

NODE=M060W;LINKAGE=E

WEIGHTED AVERAGE
159±21 (Error scaled by 1.3)



$K_3^*(1780)$ width (MeV)

$K_3^*(1780)$ DECAY MODES

NODE=M060215;NODE=M060

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 K\rho$	(31 ± 9) %	
$\Gamma_2 K^*(892)\pi$	(20 ± 5) %	
$\Gamma_3 K\pi$	(18.8 ± 1.0) %	
$\Gamma_4 K\eta$	(30 ± 13) %	
$\Gamma_5 K_2^*(1430)\pi$	< 16 %	95%

DESIG=3

DESIG=2

DESIG=1

DESIG=6

DESIG=4

CONSTRAINED FIT INFORMATION

An overall fit to 3 branching ratios uses 4 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 = 0.0$ for 1 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	85			
x_3	18	21		
x_4	-98	-94	-27	
	x_1	x_2	x_3	

$K_3^*(1780)$ BRANCHING RATIOS

$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_1/Γ_2
1.52±0.23 OUR FIT					
1.52±0.21±0.10	ASTON	87	LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

$\Gamma(K^*(892)\pi)/\Gamma(K\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_2/Γ_3
1.09±0.26 OUR FIT					
1.09±0.26	ASTON	84B	LASS	0	11 $K^- p \rightarrow \bar{K}^0 2\pi n$

$\Gamma(K\pi)/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_3/Γ
0.188±0.010 OUR FIT					

0.188±0.010 OUR AVERAGE

0.187±0.008±0.008	ASTON	88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
0.19 ± 0.02	ESTABROOKS	78	ASPK	0	13 $K^\pm p \rightarrow K\pi N$

$\Gamma(K\eta)/\Gamma(K\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_4/Γ_3
1.6 ± 0.7 OUR FIT					

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.41±0.050	¹² BIRD	89	LASS	-	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
0.50±0.18	ASTON	88B	LASS	-	11 $K^- p \rightarrow K^- \eta p$

¹²This result supersedes ASTON 88B.

$\Gamma(K_2^*(1430)\pi)/\Gamma(K^*(892)\pi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	Γ_5/Γ_2
<0.78	95	ASTON	87	LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

$K_3^*(1780)$ REFERENCES

BIRD	89	SLAC-332	P.F. Bird	(SLAC)	NODE=M060
ASTON	88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=41002
ASTON	88B	PL B201 169	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=40262
ASTON	87	NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)	REFID=40281
ASTON	84B	NP B247 261	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA)	REFID=40234
BAUBILLIER	84B	ZPHY C26 37	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)	REFID=22763
BAUBILLIER	82B	NP B202 21	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)	REFID=22459
CLELAND	82	NP B208 189	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)	REFID=22551
ASTON	81D	PL 99B 502	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP	REFID=22455
TOAFF	81	PR D23 1500	S. Toaff <i>et al.</i>	(ANL, KANS)	REFID=22820
ETKIN	80	PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP	REFID=22454
BEUSCH	78	PL 74B 282	W. Beusch <i>et al.</i>	(CERN, AAC3, ETH) JP	REFID=22545
CHUNG	78	PRL 40 355	S.U. Chung <i>et al.</i>	(BNL, BRAN, CUNY+) JP	REFID=22537
ESTABROOKS	78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+) JP	REFID=22814
Also		PR D17 658	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)	REFID=22443
BALDI	76	PL 63B 344	R. Baldi <i>et al.</i>	(GEVA) JP	REFID=22444
BRANDENB...	76D	PL 60B 478	G.W. Brandenburg <i>et al.</i>	(SLAC) JP	REFID=22807
					REFID=22808

$K_2(1820)$

$I(J^P) = \frac{1}{2}(2^-)$

See our mini-review in the 2004 edition of this *Review* (PDG 04)
under $K_2(1770)$.

$K_2(1820)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1816±13	¹ ASTON	93	LASS $11K^- p \rightarrow K^- \omega p$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~1840	² DAUM	81C	CNTR 63 $K^- p \rightarrow K^- 2\pi p$
1 From a partial wave analysis of the $K^- \omega$ system.			
2 From a partial wave analysis of the $K^- 2\pi$ system.			

NODE=M146

NODE=M146M

NODE=M146M

NODE=M146M;LINKAGE=A
NODE=M146M;LINKAGE=C

NODE=M146W

NODE=M146W

NODE=M146W;LINKAGE=B
NODE=M146W;LINKAGE=C

NODE=M146215;NODE=M146

DESIG=5

DESIG=1;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=6;OUR EVAL; \rightarrow UNCHECKED \leftarrow

NODE=M146220

NODE=M146R1
NODE=M146R1

NODE=M146R2
NODE=M146R2

NODE=M146R3
NODE=M146R3

NODE=M146

REFID=49653
REFID=43597
REFID=22548

$K_2(1820)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K\pi\pi$	
Γ_2 $K_2^*(1430)\pi$	seen
Γ_3 $K^*(892)\pi$	seen
Γ_4 $Kf_2(1270)$	seen
Γ_5 $K\omega$	seen

$K_2(1820)$ BRANCHING RATIOS

$\Gamma(K_2^*(1430)\pi)/\Gamma(K\pi\pi)$	Γ_2/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
~0.77	DAUM 81C CNTR 63 $K^- p \rightarrow \bar{K}2\pi p$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
$\Gamma(K^*(892)\pi)/\Gamma(K\pi\pi)$	Γ_3/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
~0.05	DAUM 81C CNTR 63 $K^- p \rightarrow \bar{K}2\pi p$
$\Gamma(Kf_2(1270))/\Gamma(K\pi\pi)$	Γ_4/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
~0.18	DAUM 81C CNTR 63 $K^- p \rightarrow \bar{K}2\pi p$

$K_2(1820)$ REFERENCES

PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)
ASTON	93	PL B308 186	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
DAUM	81C	NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)

K(1830)

$$I(J^P) = \frac{1}{2}(0^-)$$

OMITTED FROM SUMMARY TABLE

Seen in partial-wave analysis of $K^- \phi$ system. Needs confirmation.**K(1830) MASS**

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 1830	ARMSTRONG 83	OMEG	—	18.5 $K^- p \rightarrow 3K p$

K(1830) WIDTH

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 250	ARMSTRONG 83	OMEG	—	18.5 $K^- p \rightarrow 3K p$

K(1830) DECAY MODES

Mode
$\Gamma_1 K\phi$

K(1830) REFERENCES

ARMSTRONG 83 NP B221 1

T.A. Armstrong *et al.*

(BARI, BIRM, CERN+) JP

K₀^{*}(1950)

$$I(J^P) = \frac{1}{2}(0^+)$$

OMITTED FROM SUMMARY TABLE

Seen in partial-wave analysis of the $K^- \pi^+$ system. Needs confirmation.**K₀^{*}(1950) MASS**

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
1945±10±20	1 ASTON 88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1917±12	2 ZHOU 06	RVUE		$K p \rightarrow K^- \pi^+ n$
1820±40	3 ANISOVICH 97C	RVUE		11 $K^- p \rightarrow K^- \pi^+ n$

1 We take the central value of the two solutions and the larger error given.

2 S-matrix pole. Using ASTON 88 and assuming $K_0^*(800)$, $K_0^*(1430)$.

3 T-matrix pole. Reanalysis of ASTON 88 data.

K₀^{*}(1950) WIDTH

<u>VALUE</u> (MeV)	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
201± 34±79	4 ASTON 88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
145± 38	5 ZHOU 06	RVUE		$K p \rightarrow K^- \pi^+ n$
250±100	6 ANISOVICH 97C	RVUE		11 $K^- p \rightarrow K^- \pi^+ n$

4 We take the central value of the two solutions and the larger error given.

5 S-matrix pole. Using ASTON 88 and assuming $K_0^*(800)$, $K_0^*(1430)$.

6 T-matrix pole. Reanalysis of ASTON 88 data.

K₀^{*}(1950) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\pi$	(52±14) %

NODE=M088

NODE=M088

NODE=M088M

NODE=M088M

NODE=M088W

NODE=M088W

NODE=M088215;NODE=M088

DESIG=1

NODE=M088

REFID=22801

NODE=M134

NODE=M134

NODE=M134M

NODE=M134M

NODE=M134M;LINKAGE=A

NODE=M134M;LINKAGE=ZU

NODE=M134M;LINKAGE=A1

NODE=M134W

NODE=M134W

NODE=M134W;LINKAGE=A

NODE=M134W;LINKAGE=ZU

NODE=M134W;LINKAGE=A1

NODE=M134215;NODE=M134

DESIG=1

$K_0^*(1950)$ BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	CHG	COMMENT	Γ_1/Γ
0.52±0.08±0.12	7 ASTON	88 LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
~0.60	8 ZHOU	06 RVUE		$K^- p \rightarrow K^- \pi^+ n$	
7 We take the central value of the two solutions and the larger error given.					
8 S-matrix pole. Using ASTON 88 and assuming $K_0^*(800)$, $K_0^*(1430)$.					

$K_0^*(1950)$ REFERENCES

ZHOU 06 NP A775 212	Z.Y. Zhou, H.Q. Zheng
ANISOVICH 97C PL B413 137	A.V. Anisovich, A.V. Sarantsev
ASTON 88 NP B296 493	D. Aston <i>et al.</i> (SLAC, NAGO, CINC, INUS)

$K_2^*(1980)$

$$I(J^P) = \frac{1}{2}(2^+)$$

OMMITTED FROM SUMMARY TABLE

Needs confirmation.

$K_2^*(1980)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
1973± 8±25		ASTON	87 LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
2020±20		TIKHOMIROV 03 SPEC		40.0	$\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
1978±40	241 ± 47	BIRD	89 LASS	—	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$

$K_2^*(1980)$ WIDTH

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
373±33±60		ASTON	87 LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
180±70		TIKHOMIROV 03 SPEC		40.0	$\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$
398±47	241 ± 47	BIRD	89 LASS	—	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$

$K_2^*(1980)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $K^*(892)\pi$	possibly seen
Γ_2 $K\rho$	possibly seen
Γ_3 $Kf_2(1270)$	possibly seen

$K_2^*(1980)$ BRANCHING RATIOS

$\Gamma(K^*(892)\pi)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
possibly seen	GULER	11 BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$	
$\Gamma(K\rho)/\Gamma_{\text{total}}$				
possibly seen	GULER	11 BELL	$B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$	
$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$				
1.49±0.24±0.09	ASTON	87 LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$

NODE=M134220

NODE=M134R1

NODE=M134R1

NODE=M134R1;LINKAGE=A

NODE=M134R1;LINKAGE=ZU

NODE=M134

REFID=51198

REFID=45815

REFID=40262

NODE=M104

NODE=M104

NODE=M104M

NODE=M104M

NODE=M104W

NODE=M104W

NODE=M104215;NODE=M104

DESIG=2

DESIG=3

DESIG=4

NODE=M104220

NODE=M104R01

NODE=M104R01

NODE=M104R02

NODE=M104R02

NODE=M104R1

NODE=M104R1

$\Gamma(K f_2(1270))/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_3/Γ
possibly seen	TIKHOMIROV 03	SPEC	$40.0 \pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	

 $K_2^*(1980)$ REFERENCES

GULER TIKHOMIROV	11 03	PR D83 032005 PAN 66 828	H. Guler <i>et al.</i> G.D. Tikhomirov <i>et al.</i>	(BELLE Collab.)
BIRD ASTON	89 87	Translated from YAF 66 860 SLAC-332 NP B292 693	P.F. Bird D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)

 $K_4^*(2045)$

$$I(J^P) = \frac{1}{2}(4^+)$$

 $K_4^*(2045)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
2045 ± 9 OUR AVERAGE		Error includes scale factor of 1.1.			
2062 ± 14 ± 13		1 ASTON	86	LASS 0	$11 K^- p \rightarrow K^- \pi^+ n$
2039 ± 10	400	2,3 CLELAND	82	SPEC ±	$50 K^+ p \rightarrow K_S^0 \pi^\pm p$
2070^{+100}_{-40}		4 ASTON	81C	LASS 0	$11 K^- p \rightarrow K^- \pi^+ n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2079 ± 7	431	TORRES	86	MPSF	$400 pA \rightarrow 4KX$
2088 ± 20	650	BAUBILLIER	82	HBC	$8.25 K^- p \rightarrow K_S^0 \pi^- p$
2115 ± 46	488	CARMONY	77	HBC 0	$9 K^+ d \rightarrow K^+ \pi^+ X$

¹ From a fit to all moments.² From a fit to 8 moments.³ Number of events evaluated by us.⁴ From energy-independent partial-wave analysis.NODE=M104R3
NODE=M104R3

NODE=M104

REFID=53668
REFID=49423REFID=41002
REFID=40234

NODE=M035

NODE=M035M

NODE=M035M

NODE=M035M;LINKAGE=E
NODE=M035M;LINKAGE=B
NODE=M035M;LINKAGE=W
NODE=M035M;LINKAGE=D

NODE=M035W

NODE=M035W

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
198 ± 30 OUR AVERAGE					
221 ± 48 ± 27		5 ASTON	86	LASS 0	$11 K^- p \rightarrow K^- \pi^+ n$
189 ± 35	400	6,7 CLELAND	82	SPEC ±	$50 K^+ p \rightarrow K_S^0 \pi^\pm p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
61 ± 58	431	TORRES	86	MPSF	$400 pA \rightarrow 4KX$
170^{+100}_{-50}	650	BAUBILLIER	82	HBC	$8.25 K^- p \rightarrow K_S^0 \pi^- p$
240^{+500}_{-100}		8 ASTON	81C	LASS 0	$11 K^- p \rightarrow K^- \pi^+ n$
300 ± 200		CARMONY	77	HBC 0	$9 K^+ d \rightarrow K^+ \pi^+ X$

⁵ From a fit to all moments.⁶ From a fit to 8 moments.⁷ Number of events evaluated by us.⁸ From energy-independent partial-wave analysis.NODE=M035W;LINKAGE=E
NODE=M035W;LINKAGE=B
NODE=M035W;LINKAGE=W
NODE=M035W;LINKAGE=D

NODE=M035215;NODE=M035

DESIG=1
DESIG=2
DESIG=5
DESIG=3
DESIG=4
DESIG=6
DESIG=7 $K_4^*(2045)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\pi$	(9.9 ± 1.2) %
$\Gamma_2 K^*(892)\pi\pi$	(9 ± 5) %
$\Gamma_3 K^*(892)\pi\pi\pi$	(7 ± 5) %
$\Gamma_4 \rho K\pi$	(5.7 ± 3.2) %
$\Gamma_5 \omega K\pi$	(5.0 ± 3.0) %
$\Gamma_6 \phi K\pi$	(2.8 ± 1.4) %
$\Gamma_7 \phi K^*(892)$	(1.4 ± 0.7) %

$K_4^*(2045)$ BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.99±0.012	ASTON 88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$	
$\Gamma(K^*(892)\pi\pi)/\Gamma(K\pi)$					Γ_2/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.89±0.53	BAUBILLIER 82	HBC	–	8.25 $K^- p \rightarrow p K_S^0 3\pi$	
$\Gamma(K^*(892)\pi\pi\pi)/\Gamma(K\pi)$					Γ_3/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.75±0.49	BAUBILLIER 82	HBC	–	8.25 $K^- p \rightarrow p K_S^0 3\pi$	
$\Gamma(\rho K\pi)/\Gamma(K\pi)$					Γ_4/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.58±0.32	BAUBILLIER 82	HBC	–	8.25 $K^- p \rightarrow p K_S^0 3\pi$	
$\Gamma(\omega K\pi)/\Gamma(K\pi)$					Γ_5/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.50±0.30	BAUBILLIER 82	HBC	–	8.25 $K^- p \rightarrow p K_S^0 3\pi$	
$\Gamma(\phi K\pi)/\Gamma_{\text{total}}$					Γ_6/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.028±0.014	9 TORRES 86	MPSF	400 $pA \rightarrow 4KX$		
$\Gamma(\phi K^*(892))/\Gamma_{\text{total}}$					Γ_7/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.014±0.007	9 TORRES 86	MPSF	400 $pA \rightarrow 4KX$		

9 Error determination is model dependent.

 $K_4^*(2045)$ REFERENCES

ASTON 88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON 86	PL B180 308	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
TORRES 86	PR D34 707	S. Torres <i>et al.</i>	(VPI, ARIZ, FNAL, FSU+)
BAUBILLIER 82	PL 118B 447	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
CLELAND 82	NP B208 189	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)
ASTON 81C	PL 106B 235	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP
CARMONY 77	PR D16 1251	D.D. Carmony <i>et al.</i>	(PURD, UCD, IUPU)

 $K_2(2250)$

$$I(J^P) = \frac{1}{2}(2^-)$$

OMITTED FROM SUMMARY TABLE

This entry contains various peaks in strange meson systems reported in the 2150–2260 MeV region, as well as enhancements seen in the antihyperon-nucleon system, either in the mass spectra or in the $J^P = 2^-$ wave.

 $K_2(2250)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
2247±17 OUR AVERAGE					
2200±40		¹ ARMSTRONG 83C	OMEG	–	18 $K^- p \rightarrow \Lambda \bar{p} X$
2235±50		¹ BAUBILLIER 81	HBC	–	8 $K^- p \rightarrow \Lambda \bar{p} X$
2260±20		¹ CLELAND 81	SPEC	±	50 $K^+ p \rightarrow \Lambda \bar{p} X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2280±20		TIKHOMIROV 03	SPEC		$40.0 \frac{\pi^- C \rightarrow}{K_S^0 K_S^0 K_L^0} X$
2147± 4	37	CHLIAPNIK...	79	HBC	+ 32 $K^+ p \rightarrow \bar{\Lambda} p X$
2240±20	20	LISSAUER	70	HBC	9 $K^+ p$

NODE=M035220

NODE=M035R1
NODE=M035R1NODE=M035R2
NODE=M035R2NODE=M035R5
NODE=M035R5NODE=M035R3
NODE=M035R3NODE=M035R4
NODE=M035R4NODE=M035R6
NODE=M035R6NODE=M035R7
NODE=M035R7

NODE=M035R;LINKAGE=A

NODE=M035

REFID=40262
REFID=22462
REFID=22845
REFID=22842
REFID=22455
REFID=22821
REFID=22811

NODE=M040

NODE=M040

NODE=M040M

NODE=M040M

$1 J^P = 2^-$ from moments analysis.

K ₂ (2250) WIDTH						
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT	
180±30 OUR AVERAGE					Error includes scale factor of 1.4.	
150±30	2	ARMSTRONG 83C	OMEG	—	18 $K^- p \rightarrow \Lambda \bar{p} X$	
210±30	2	CLELAND 81	SPEC	±	50 $K^+ p \rightarrow \Lambda \bar{p} X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
180±60		TIKHOMIROV 03	SPEC		40.0 $\pi^- C \rightarrow K_S^0 K_S^0 K_L^0 X$	
~ 200		BAUBILLIER 81	HBC	—	8 $K^- p \rightarrow \Lambda \bar{p} X$	
~ 40	37	CHLIAPNIK... 79	HBC	+	32 $K^+ p \rightarrow \Lambda \bar{p} X$	
80±20	20	LISSAUER 70	HBC		9 $K^+ p$	

 $2 J^P = 2^-$ from moments analysis.

K ₂ (2250) DECAY MODES						
Mode						
Γ_1	$K \pi \pi$					
Γ_2	$K f_2(1270)$					
Γ_3	$K^*(892) f_0(980)$					
Γ_4	$p \bar{\Lambda}$					

K ₂ (2250) REFERENCES						
TIKHOMIROV 03	PAN 66 828	G.D. Tikhomirov <i>et al.</i>				
ARMSTRONG 83C	NP B227 365	Translated from YAF 66 860. T.A. Armstrong <i>et al.</i>				
BAUBILLIER 81	NP B183 1	M. Baubillier <i>et al.</i>	(BARI, BIRM, CERN+)			
CLELAND 81	NP B184 1	W.E. Cleland <i>et al.</i>	(BIRM, CERN, GLAS+) JP			
CHLIAPNIK... 79	NP B158 253	P.V. Chliapnikov <i>et al.</i>	(PITT, GEVA, LAUS+) JP			
LISSAUER 70	NP B18 491	D. Lissauer <i>et al.</i>	(CERN, BELG, MONS) (LBL)			

K ₃ (2320)						
$I(J^P) = \frac{1}{2}(3^+)$						

OMMITTED FROM SUMMARY TABLE
 Seen in the $J^P = 3^+$ wave of the antihyperon-nucleon system.
 Needs confirmation.

K ₃ (2320) MASS						
VALUE (MeV)		DOCUMENT ID	TECN	CHG	COMMENT	
2324±24 OUR AVERAGE						
2330±40	1	ARMSTRONG 83C	OMEG	—	18 $K^- p \rightarrow \Lambda \bar{p} X$	
2320±30	1	CLELAND 81	SPEC	±	50 $K^+ p \rightarrow \Lambda \bar{p} X$	

 $1 J^P = 3^+$ from moments analysis.

K ₃ (2320) WIDTH						
VALUE (MeV)		DOCUMENT ID	TECN	CHG	COMMENT	
150±30	2	ARMSTRONG 83C	OMEG	—	18 $K^- p \rightarrow \Lambda \bar{p} X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
~ 250	2	CLELAND 81	SPEC	±	50 $K^+ p \rightarrow \Lambda \bar{p} X$	

 $2 J^P = 3^+$ from moments analysis.

K ₃ (2320) DECAY MODES						
Mode						
Γ_1	$p \bar{\Lambda}$					

K ₃ (2320) REFERENCES						
ARMSTRONG 83C	NP B227 365	T.A. Armstrong <i>et al.</i>	(BARI, BIRM, CERN+)			
CLELAND 81	NP B184 1	W.E. Cleland <i>et al.</i>	(PITT, GEVA, LAUS+)			

NODE=M040M;LINKAGE=Q

NODE=M040W

NODE=M040W

NODE=M040W;LINKAGE=Q

NODE=M040215;NODE=M040

DESIG=1

DESIG=3

DESIG=4

DESIG=2

NODE=M040

REFID=49423

REFID=22852

REFID=22850

REFID=22851

REFID=22849

REFID=22847

NODE=M090

NODE=M090

NODE=M090M

NODE=M090M

NODE=M090M;LINKAGE=P

NODE=M090W

NODE=M090W

NODE=M090W;LINKAGE=P

NODE=M090215;NODE=M090

DESIG=1

NODE=M090

REFID=22852

REFID=22851

$K_5^*(2380)$

$I(J^P) = \frac{1}{2}(5^-)$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

 $K_5^*(2380)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
2382±14±19	1 ASTON 86	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$

1 From a fit to all the moments.

 $K_5^*(2380)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
178±37±32	2 ASTON 86	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$

2 From a fit to all the moments.

 $K_5^*(2380)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 K\pi$	(6.1±1.2) %

 $K_5^*(2380)$ BRANCHING RATIOS

$\Gamma(K\pi)/\Gamma_{\text{total}}$	Γ_1/Γ
0.061±0.012	ASTON 88 LASS 0 11 $K^- p \rightarrow K^- \pi^+ n$

 $K_5^*(2380)$ REFERENCES

ASTON 88 NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON 86 PL B180 308	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)

 $K_4(2500)$

$I(J^P) = \frac{1}{2}(4^-)$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

 $K_4(2500)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
2490±20	1 CLELAND 81 SPEC ±	50 $K^+ p \rightarrow \Lambda\bar{p}$		

1 $J^P = 4^-$ from moments analysis. **$K_4(2500)$ WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				

~250 2 CLELAND 81 SPEC ± 50 $K^+ p \rightarrow \Lambda\bar{p}$

2 $J^P = 4^-$ from moments analysis. **$K_4(2500)$ DECAY MODES**

Mode
$\Gamma_1 p\bar{\Lambda}$

 $K_4(2500)$ REFERENCES

CLELAND 81 NP B184 1	W.E. Cleland <i>et al.</i>	(PITT, GEVA, LAUS+)
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NODE=M098

NODE=M098

NODE=M098M

NODE=M098M

NODE=M098M;LINKAGE=E

NODE=M098W

NODE=M098W

NODE=M098W;LINKAGE=E

NODE=M098215;NODE=M098

DESIG=1

NODE=M098220

NODE=M098R1
NODE=M098R1

NODE=M098

REFID=40262

REFID=22462

NODE=M091

NODE=M091

NODE=M091M

NODE=M091M

NODE=M091M;LINKAGE=R

NODE=M091W

NODE=M091W

NODE=M091W;LINKAGE=R

NODE=M091215;NODE=M091

DESIG=1

NODE=M091

REFID=22851

K(3100) $I^G(J^P)$ = ??(???)

OMITTED FROM SUMMARY TABLE

Narrow peak observed in several ($\Lambda\bar{p}$ + pions) and ($\bar{\Lambda}p$ + pions) states in Σ^- Be reactions by BOURQUIN 86 and in np and nA reactions by ALEEV 93. Not seen by BOEHNLEIN 91. If due to strong decays, this state has exotic quantum numbers ($B=0, Q=+1, S=-1$ for $\Lambda\bar{p}\pi^+\pi^+$ and $I \geq 3/2$ for $\Lambda\bar{p}\pi^-$). Needs confirmation.

NODE=M129

K(3100) MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<u>≈ 3100 OUR ESTIMATE</u>	

3-BODY DECAYS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>3054±11 OUR AVERAGE</u>			

3060± 7±20			
3056± 7±20			
3055± 8±20			
3045± 8±20			

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^+$
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^-$
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^-$
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^+$

4-BODY DECAYS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>3059±11 OUR AVERAGE</u>			

3067± 6±20			
3060± 8±20			
3055± 7±20			
3052± 8±20			

<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^+$
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^-$
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^-\pi^-$
¹ ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^-\pi^+$

• • • We do not use the following data for averages, fits, limits, etc. • • •

3105±30	BOURQUIN 86	SPEC	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^+$
3115±30	BOURQUIN 86	SPEC	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^-$

5-BODY DECAYS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>3095±30 OUR AVERAGE</u>			

• • • We do not use the following data for averages, fits, limits, etc. • • •

3095±30	BOURQUIN 86	SPEC	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^+\pi^-$
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¹ Supersedes ALEEV 90.

NODE=M129205

NODE=M129M
→ UNCHECKED ←

NODE=M129M1
NODE=M129M1

NODE=M129M2
NODE=M129M2

OCCUR=2
OCCUR=3
OCCUR=4

NODE=M129M3
NODE=M129M3

NODE=M129M;LINKAGE=A

NODE=M129210

NODE=M129W1
NODE=M129W1

OCCUR=2
OCCUR=3
OCCUR=4

NODE=M129W2
NODE=M129W2

OCCUR=2
OCCUR=3
OCCUR=4

NODE=M129W3
NODE=M129W3

NODE=M129W;LINKAGE=A

K(3100) WIDTH**3-BODY DECAYS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>• • • We do not use the following data for averages, fits, limits, etc. • • •</u>			

42±16	² ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^+$
36±15	² ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^-$
50±18	² ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^-$
30±15	² ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^+$

4-BODY DECAYS

<u>VALUE (MeV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>• • • We do not use the following data for averages, fits, limits, etc. • • •</u>				

22± 8	² ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^+$	
28±12	² ALEEV 93	BIS2	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^-$	
32±15	² ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^-\pi^-$	
30±15	² ALEEV 93	BIS2	$K(3100) \rightarrow \bar{\Lambda}p\pi^-\pi^+$	
<30	90	BOURQUIN 86	SPEC	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^+$
<80	90	BOURQUIN 86	SPEC	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^-$

5-BODY DECAYS

<u>VALUE (MeV)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>• • • We do not use the following data for averages, fits, limits, etc. • • •</u>				

<30	90	BOURQUIN 86	SPEC	$K(3100) \rightarrow \Lambda\bar{p}\pi^+\pi^+\pi^-$
-----	----	-------------	------	---

² Supersedes ALEEV 90.

K(3100) DECAY MODES

NODE=M129215;NODE=M129

Mode
$\Gamma_1 \quad K(3100)^0 \rightarrow \Lambda \bar{p} \pi^+$
$\Gamma_2 \quad K(3100)^{-} \rightarrow \Lambda \bar{p} \pi^{-}$
$\Gamma_3 \quad K(3100)^{-} \rightarrow \Lambda \bar{p} \pi^{+} \pi^{-}$
$\Gamma_4 \quad K(3100)^{+} \rightarrow \Lambda \bar{p} \pi^{+} \pi^{+}$
$\Gamma_5 \quad K(3100)^0 \rightarrow \Lambda \bar{p} \pi^{+} \pi^{+} \pi^{-}$
$\Gamma_6 \quad K(3100)^0 \rightarrow \Sigma(1385)^{+} \bar{p}$

$\Gamma(\Sigma(1385)^{+} \bar{p})/\Gamma(\Lambda \bar{p} \pi^{+})$	Γ_6/Γ_1
$VALUE \quad CL\%$	$DOCUMENT ID \quad TECN \quad COMMENT$
<0.04	90 ALEEV 93 BIS2 $K(3100)^0 \rightarrow \Sigma(1385)^{+} \bar{p}$

K(3100) REFERENCES

ALEEV	93	PAN 56 1358 Translated from YAF 56 100.	A.N. Aleev <i>et al.</i>	(BIS-2 Collab.)
BOEHNLEIN	91	NPBPS B21 174	A. Boehlein <i>et al.</i>	(FLOR, BNL, IND+)
ALEEV	90	ZPHY C47 533	A.N. Aleev <i>et al.</i>	(BIS-2 Collab.)
BOURQUIN	86	PL B172 113	M.H. Bourquin <i>et al.</i>	(GEVA, RAL, HEIDP+)

CHARMED MESONS (C = ±1)

$$D^+ = c\bar{d}, D^0 = c\bar{u}, \bar{D}^0 = \bar{c}u, D^- = \bar{c}d, \text{ similarly for } D^* \text{'s}$$

$D^*(2007)^0$

$$I(J^P) = \frac{1}{2}(1^-)$$

I, J, P need confirmation.

J consistent with 1, value 0 ruled out (NGUYEN 77).

$D^*(2007)^0$ MASS

The fit includes $D^{\pm}, D^0, D_s^{\pm}, D^{*\pm}, D^{*0}, D_s^{*\pm}, D_1(2420)^0, D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2006.99±0.15 OUR FIT			
[2006.98 ± 0.15 MeV OUR 2012 FIT]			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2006 ± 1.5	¹ GOLDHABER 77 MRK1 $e^+ e^-$		
¹ From simultaneous fit to $D^*(2010)^+, D^*(2007)^0, D^+, \text{ and } D^0$.			

$m_{D^*(2007)^0} - m_{D^0}$

The fit includes $D^{\pm}, D^0, D_s^{\pm}, D^{*\pm}, D^{*0}, D_s^{*\pm}, D_1(2420)^0, D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
142.12±0.07 OUR FIT				
142.12±0.07 OUR AVERAGE				
142.2 ± 0.3 ± 0.2	145	ALBRECHT 95F ARG	$e^+ e^- \rightarrow \text{hadrons}$	
142.12±0.05±0.05	1176	BORTOLETTO92B CLE2	$e^+ e^- \rightarrow \text{hadrons}$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
142.2 ± 2.0		SADROZINSKI 80 CBAL	$D^{*0} \rightarrow D^0 \pi^0$	
142.7 ± 1.7		² GOLDHABER 77 MRK1	$e^+ e^-$	

DESIG=1
DESIG=2
DESIG=3
DESIG=4
DESIG=5
DESIG=6

NODE=M129R1
NODE=M129

NODE=M129
REFID=43668
REFID=41743
REFID=42173
REFID=22928

NODE=MXXX035

NODE=MXXX035

NODE=M061

NODE=M061

NODE=M061M

NODE=M061M

NODE=M061M
NEW

NODE=M061M;LINKAGE=G

NODE=M061DM

NODE=M061DM

NODE=M061DM

² From simultaneous fit to $D^*(2010)^+$, $D^*(2007)^0$, D^+ , and D^0 .

$D^*(2007)^0$ WIDTH

VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT
<2.1	90	³ ABACHI	88B HRS	$D^{*0} \rightarrow D^+ \pi^-$
³ Assuming $m_{D^{*0}} = 2007.2 \pm 2.1$ MeV/ c^2 .				

$D^*(2007)^0$ DECAY MODES

$\overline{D}^*(2007)^0$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^0 \pi^0$	(61.9±2.9) %
$\Gamma_2 D^0 \gamma$	(38.1±2.9) %

CONSTRAINED FIT INFORMATION

An overall fit to a branching ratio uses 3 measurements and one constraint to determine 2 parameters. The overall fit has a $\chi^2 = 0.5$ for 2 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|c} x_2 & -100 \\ \hline & x_1 \end{array}$$

$D^*(2007)^0$ BRANCHING RATIOS

$\Gamma(D^0 \pi^0)/\Gamma(D^0 \gamma)$	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ_2
1.74±0.02±0.13	AUBERT,BE	05G BABR	10.6 $e^+ e^- \rightarrow$ hadrons	

$\Gamma(D^0 \pi^0)/\Gamma_{\text{total}}$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ_2
0.619±0.029 OUR FIT					

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.635±0.003±0.017	69k	⁴ AUBERT,BE	05G BABR	10.6 $e^+ e^- \rightarrow$ hadrons
0.596±0.035±0.028	858	⁵ ALBRECHT	95F ARG	$e^+ e^- \rightarrow$ hadrons
0.636±0.023±0.033	1097	⁵ BUTLER	92 CLE2	$e^+ e^- \rightarrow$ hadrons

$\Gamma(D^0 \gamma)/\Gamma_{\text{total}}$	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
0.381±0.029 OUR FIT					

0.381±0.029 OUR AVERAGE				
0.404±0.035±0.028	456	⁵ ALBRECHT	95F ARG	$e^+ e^- \rightarrow$ hadrons
0.364±0.023±0.033	621	⁵ BUTLER	92 CLE2	$e^+ e^- \rightarrow$ hadrons
0.37 ± 0.08 ± 0.08		ADLER	88D MRK3	$e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.365±0.003±0.017	68k	⁴ AUBERT,BE	05G BABR	10.6 $e^+ e^- \rightarrow$ hadrons
0.47 ± 0.23		LOW	87 HRS	29 GeV $e^+ e^-$
0.53 ± 0.13		BARTEL	85G JADE	$e^+ e^-$, hadrons
0.47 ± 0.12		COLES	82 MRK2	$e^+ e^-$
0.45 ± 0.15		GOLDHABER	77 MRK1	$e^+ e^-$

⁴ Derived from the ratio $\Gamma(D^0 \pi^0) / \Gamma(D^0 \gamma)$ assuming that the branching fractions of $D^{*0} \rightarrow D^0 \pi^0$ and $D^{*0} \rightarrow D^0 \gamma$ decays sum to 100%

⁵ The BUTLER 92 and ALBRECHT 95F branching ratios are not independent, they have been constrained by the authors to sum to 100%.

NODE=M061DM;LINKAGE=G

NODE=M061W

NODE=M061W

NODE=M061W;LINKAGE=A

NODE=M061220;NODE=M061

NODE=M061

DESIG=1

DESIG=2

NODE=M061225

NODE=M061R3
NODE=M061R3

NODE=M061R2
NODE=M061R2

NODE=M061R1
NODE=M061R1

NODE=M061R;LINKAGE=AU

NODE=M061R;LINKAGE=A

D*(2007)⁰ REFERENCES

AUBERT,BE	05G	PR D72 091101	B. Aubert <i>et al.</i>	(BABAR Collab.)
ALBRECHT	95F	ZPHY C66 63	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BORTOLETTO	92B	PRL 69 2046	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
BUTLER	92	PRL 69 2041	F. Butler <i>et al.</i>	(CLEO Collab.)
ABACHI	88B	PL B212 533	S. Abachi <i>et al.</i>	(ANL, IND, MICH, PURD+)
ADLER	88D	PL B208 152	J. Adler <i>et al.</i>	(Mark III Collab.)
LOW	87	PL B183 232	E.H. Low <i>et al.</i>	(HRS Collab.)
BARTEL	85G	PL 161B 197	W. Bartel <i>et al.</i>	(JADE Collab.)
COLES	82	PR D26 2190	M.W. Coles <i>et al.</i>	(LBL, SLAC)
SADROZINSKI	80	Madison Conf. 681	H.F.W. Sdrozinski <i>et al.</i>	(PRIN, CIT+)
GOLDHABER	77	PL 69B 503	G. Goldhaber <i>et al.</i>	(Mark I Collab.)
NGUYEN	77	PRL 39 262	H.K. Nguyen <i>et al.</i>	(LBL, SLAC) J

NODE=M061

REFID=50942
REFID=44374
REFID=43116
REFID=43170
REFID=40584
REFID=40579
REFID=40017
REFID=22880
REFID=22866
REFID=22877
REFID=11434
REFID=11543

NODE=M062

D*(2010)[±]

$$I(J^P) = \frac{1}{2}(1^-)$$

I, J, P need confirmation.

D*(2010)[±] MASS

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*(2460)}{}^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
2010.29±0.13 OUR FIT				
[2010.28 ± 0.13 MeV OUR 2012 FIT]				

• • • We do not use the following data for averages, fits, limits, etc. • • •

2008	±3	1 GOLDHABER 77	MRK1	±	$e^+ e^-$
2008.6	±1.0	2 PERUZZI 77	LGW	±	$e^+ e^-$

¹ From simultaneous fit to $D^*(2010)^+$, $D^*(2007)^0$, D^+ , and D^0 ; not independent of FELDMAN 77B mass difference below.

² PERUZZI 77 mass not independent of FELDMAN 77B mass difference below and PERUZZI 77 D^0 mass value.

NODE=M062M

NODE=M062M

NODE=M062M
NEW

NODE=M062M;LINKAGE=G

NODE=M062M;LINKAGE=P

NODE=M062MD

NODE=M062MD

NODE=M062MD

NODE=M062DM

NODE=M062DM

NODE=M062DM

NODE=M062DM

NODE=M062DM

OCCUR=2

OCCUR=2

OCCUR=2

OCCUR=2

 $m_{D^*(2010)^+} - m_{D^+}$

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*(2460)}{}^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
140.66±0.10 OUR FIT				
Error includes scale factor of 1.1.				
140.64±0.08±0.06	620	BORTOLETTO92B	CLE2	$e^+ e^- \rightarrow$ hadrons

 $m_{D^*(2010)^+} - m_{D^0}$

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*(2460)}{}^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
145.421±0.010 OUR FIT				
Error includes scale factor of 1.1.				
145.421±0.010 OUR AVERAGE				
145.412±0.002±0.012		ANASTASSOV 02	CLE2	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi) \pi^\pm$
145.54 ± 0.08	611	³ ADINOLFI 99	BEAT	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.45 ± 0.02		³ BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi) \pi^\pm$
145.42 ± 0.05		³ BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^- 3\pi) \pi^\pm$
145.5 ± 0.15	103	⁴ ADLOFF 97B	H1	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.44 ± 0.08	152	⁴ BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.42 ± 0.11	199	⁴ BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow K^- 3\pi$
145.4 ± 0.2	48	⁴ DERRICK 95	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow K^- \pi^+$
145.39 ± 0.06 ± 0.03		BARLAG 92B	ACCM	π^- 230 GeV
145.5 ± 0.2	115	⁴ ALEXANDER 91B	OPAL	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.30 ± 0.06		⁴ DECAMP 91J	ALEP	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.40 ± 0.05 ± 0.10		ABACHI 88B	HRS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.46 ± 0.07 ± 0.03		ALBRECHT 85F	ARG	$D^{*\pm} \rightarrow D^0 \pi^+$
145.5 ± 0.3	28	BAILEY 83	SPEC	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.5 ± 0.3	60	FITCH 81	SPEC	π^- A
145.3 ± 0.5	30	FELDMAN 77B	MRK1	$D^{*\pm} \rightarrow D^0 \pi^+$

NODE=M062DM

NODE=M062DM

NODE=M062DM

OCCUR=2

OCCUR=2

OCCUR=2

OCCUR=2

• • • We do not use the following data for averages, fits, limits, etc. • • •

145.44 \pm 0.09	122	⁴ BREITWEG	97B ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm$, $D^0 \rightarrow K^- \pi^+$
145.8 \pm 1.5	16	AHLEN	83 HRS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.1 \pm 1.8	12	BAILEY	83 SPEC	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.1 \pm 0.5	14	BAILEY	83 SPEC	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.5 \pm 0.5	14	YELTON	82 MRK2	$29 e^+ e^- \rightarrow K^- \pi^+$
~ 145.5		AVERY	80 SPEC	γA
145.2 \pm 0.6	2	BLIETSCHAU	79 BEBC	νp

³ Statistical errors only.

⁴ Systematic error not evaluated.

OCCUR=3

$m_{D^*(2010)^+} - m_{D^*(2007)^0}$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

2.6 \pm 1.8	⁵ PERUZZI	77 LGW	$e^+ e^-$
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⁵ Not independent of FELDMAN 77B mass difference above, PERUZZI 77 D^0 mass, and GOLDHABER 77 $D^*(2007)^0$ mass.

NODE=M062DM;LINKAGE=AV

NODE=M062DM;LINKAGE=A

NODE=M062EM

NODE=M062EM

NODE=M062EM;LINKAGE=P

NODE=M062W

NODE=M062W

$D^*(2010)^\pm$ WIDTH

VALUE (keV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	-----	------	-------------	------	---------

96 \pm 4 \pm 22			ANASTASSOV 02	CLE2	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K \pi) \pi^\pm$
--	--	--	---------------	------	--

• • • We do not use the following data for averages, fits, limits, etc. • • •

<131	90	110	BARLAG	92B ACCM	π^- 230 GeV
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$D^*(2010)^\pm$ DECAY MODES

$D^*(2010)^-$ modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)
Γ_1 $D^0 \pi^+$	(67.7 \pm 0.5) %
Γ_2 $D^+ \pi^0$	(30.7 \pm 0.5) %
Γ_3 $D^+ \gamma$	(1.6 \pm 0.4) %

CONSTRAINED FIT INFORMATION

An overall fit to 3 branching ratios uses 6 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 0.3$ for 4 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{c|cc} & & \\ x_2 & -62 & \\ & -43 & -44 \\ x_3 & & \\ & x_1 & x_2 \end{array}$$

NODE=M062225;NODE=M062

NODE=M062

DESIG=1

DESIG=3

DESIG=2

$D^*(2010)^+$ BRANCHING RATIOS

$\Gamma(D^0 \pi^+)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	COMMENT
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0.677 \pm 0.005 OUR FIT

0.677 \pm 0.006 OUR AVERAGE

0.6759 \pm 0.0029 \pm 0.0064	6,7,8 BARTELT	98 CLE2	$e^+ e^-$
0.688 \pm 0.024 \pm 0.013	ALBRECHT	95F ARG	$e^+ e^- \rightarrow \text{hadrons}$
0.681 \pm 0.010 \pm 0.013	⁶ BUTLER	92 CLE2	$e^+ e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.57 \pm 0.04 \pm 0.04	ADLER	88D MRK3	$e^+ e^-$
0.44 \pm 0.10	COLES	82 MRK2	$e^+ e^-$
0.6 \pm 0.15	⁸ GOLDHABER	77 MRK1	$e^+ e^-$

NODE=M062230

NODE=M062R1

NODE=M062R1

$\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
0.307 ± 0.005 OUR FIT					NODE=M062R3
0.3073±0.0013±0.0062	6,7,8	BARTEL	98	CLE2 $e^+ e^-$	NODE=M062R3
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.312 ± 0.011 ± 0.008	1404	ALBRECHT	95F	ARG $e^+ e^- \rightarrow$ hadrons	
0.308 ± 0.004 ± 0.008	410	⁶ BUTLER	92	CLE2 $e^+ e^- \rightarrow$ hadrons	
0.26 ± 0.02 ± 0.02		ADLER	88D	MRK3 $e^+ e^-$	
0.34 ± 0.07		COLES	82	MRK2 $e^+ e^-$	

 $\Gamma(D^+\gamma)/\Gamma_{\text{total}}$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
0.016 ± 0.004 OUR FIT						NODE=M062R2
0.016 ± 0.005 OUR AVERAGE						NODE=M062R2
0.0168 ± 0.0042 ± 0.0029		6,7	BARTEL	98	CLE2 $e^+ e^-$	
0.011 ± 0.014 ± 0.016	12	⁶ BUTLER	92	CLE2 $e^+ e^- \rightarrow$ hadrons		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.052	90	ALBRECHT	95F	ARG $e^+ e^- \rightarrow$ hadrons		
0.17 ± 0.05 ± 0.05		ADLER	88D	MRK3 $e^+ e^-$		
0.22 ± 0.12		⁹ COLES	82	MRK2 $e^+ e^-$		

6 The branching ratios are not independent, they have been constrained by the authors to sum to 100%.

7 Systematic error includes theoretical error on the prediction of the ratio of hadronic modes.

8 Assuming that isospin is conserved in the decay.

9 Not independent of $\Gamma(D^0\pi^+)/\Gamma_{\text{total}}$ and $\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$ measurement.

 $D^*(2010)^\pm$ REFERENCES

ANASTASSOV 02	PR D65 032003	A. Anastassov <i>et al.</i>	(CLEO Collab.)	REFID=48550
ADINOLFI 99	NP B547 3	M. Adinolfi <i>et al.</i>	(Beatrice Collab.)	REFID=46925
BREITWEG 99	EPJ C6 67	J. Breitweg <i>et al.</i>	(ZEUS Collab.)	REFID=46604
BARTELT 98	PRL 80 3919	J. Bartelt <i>et al.</i>	(CLEO Collab.)	REFID=46349
ADLOFF 97B	ZPHY C72 593	C. Adloff <i>et al.</i>	(H1 Collab.)	REFID=45421
BREITWEG 97	PL B401 192	J. Breitweg <i>et al.</i>	(ZEUS Collab.)	REFID=45520
BREITWEG 97B	PL B407 402	J. Breitweg <i>et al.</i>	(ZEUS Collab.)	REFID=45699
ALBRECHT 95F	ZPHY C66 63	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=44374
DERRICK 95	PL B349 225	M. Derrick <i>et al.</i>	(ZEUS Collab.)	REFID=44373
BARLAG 92B	PL B278 480	S. Barlag <i>et al.</i>	(ACCMOR Collab.)	REFID=42174
BORTOLETTO 92B	PRL 69 2046	D. Bortolotto <i>et al.</i>	(CLEO Collab.)	REFID=43116
BUTLER 92	PRL 69 2041	F. Butler <i>et al.</i>	(CLEO Collab.)	REFID=43170
ALEXANDER 91B	PL B262 341	G. Alexander <i>et al.</i>	(OPAL Collab.)	REFID=41553
DECAMP 91J	PL B266 218	D. Decamp <i>et al.</i>	(ALEPH Collab.)	REFID=41614
ABACHI 88B	PL B212 533	S. Abachi <i>et al.</i>	(ANL, IND, MICH, PURD+)	REFID=40584
ADLER 88D	PL B208 152	J. Adler <i>et al.</i>	(Mark III Collab.)	REFID=40579
ALBRECHT 85F	PL 150B 235	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=11527
AHLEN 83	PRL 51 1147	S.P. Ahlen <i>et al.</i>	(ANL, IND, LBL+)	REFID=22868
BAILEY 83	PL 132B 230	R. Bailey <i>et al.</i>	(AMST, BRIS, CERN, CRAC+)	REFID=22870
COLES 82	PR D26 2190	M.W. Coles <i>et al.</i>	(LBL, SLAC)	REFID=22866
YELTON 82	PRL 49 430	J.M. Yelton <i>et al.</i>	(SLAC, LBL, UCB+)	REFID=22867
FITCH 81	PRL 46 761	V.L. Fitch <i>et al.</i>	(PRIN, SACL, TORI+)	REFID=22863
AVERY 80	PRL 44 1309	P. Avery <i>et al.</i>	(ILL, FNAL, COLU)	REFID=11498
BLIETSCHAU 79	PL 86B 108	J. Blietschau <i>et al.</i>	(AACH3, BONN, CERN+)	REFID=22861
FELDMAN 77B	PRL 38 1313	G.J. Feldman <i>et al.</i>	(Mark I Collab.)	REFID=22858
GOLDHABER 77	PL 69B 503	G. Goldhaber <i>et al.</i>	(Mark I Collab.)	REFID=11434
PERUZZI 77	PRL 39 1301	I. Peruzzi <i>et al.</i>	(LGW Collab.)	REFID=11435

NODE=M062R3

NODE=M062R3

NODE=M062R2

NODE=M062R2

NODE=M062R;LINKAGE=A

NODE=M062R;LINKAGE=B

NODE=M062R;LINKAGE=G

NODE=M062R;LINKAGE=C

NODE=M062

$D_0^*(2400)^0$

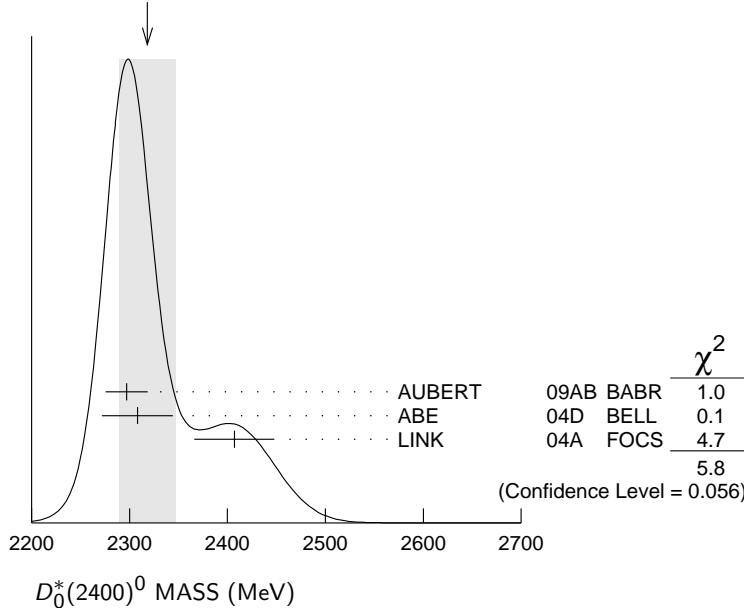
$$I(J^P) = \frac{1}{2}(0^+)$$

$J^P = 0^+$ assignment favored (ABE 04D).

$D_0^*(2400)^0$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2318±29 OUR AVERAGE Error includes scale factor of 1.7. See the ideogram below.				
2297± 8±20	3.4k	AUBERT	09AB BABR	$B^- \rightarrow D^+ \pi^- \pi^-$
2308±17±32		ABE	04D BELL	$B^- \rightarrow D^+ \pi^- \pi^-$
2407±21±35	9.8k	LINK	04A FOCS	γ A

WEIGHTED AVERAGE
2318±29 (Error scaled by 1.7)



$D_0^*(2400)^0$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
267±40 OUR AVERAGE				
273±12±48	3.4k	AUBERT	09AB BABR	$B^- \rightarrow D^+ \pi^- \pi^-$
276±21±63		ABE	04D BELL	$B^- \rightarrow D^+ \pi^- \pi^-$
240±55±59	9.8k	LINK	04A FOCS	γ A

$D_0^*(2400)^0$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad D^+ \pi^-$	seen

$D_0^*(2400)^0$ REFERENCES

AUBERT	09AB PR D79 112004	B. Aubert <i>et al.</i>	(BABAR Collab.)
ABE	04D PR D69 112002	K. Abe <i>et al.</i>	(BELLE Collab.)
LINK	04A PL B586 11	J.M. Link <i>et al.</i>	(FOCUS Collab.)

NODE=M178

NODE=M178

NODE=M178M

NODE=M178M

NODE=M178W

NODE=M178W

NODE=M178215; NODE=M178

DESIG=1;OUR EVAL;→ UNCHECKED ←

NODE=M178

REFID=52941

REFID=50011

REFID=49775

$D_0^*(2400)^\pm$ $I(J^P) = \frac{1}{2}(0^+)$

OMITTED FROM SUMMARY TABLE

J, P need confirmation.

$D_0^*(2400)^\pm$ MASS				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2403±14±35	18.8k	LINK	04A FOCS	γ A

$D_0^*(2400)^\pm$ WIDTH				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
283±24±34	18.8k	LINK	04A FOCS	γ A

$D_0^*(2400)^\pm$ DECAY MODES				
Mode	Fraction (Γ_i/Γ)			
$\Gamma_1 D^0 \pi^+$	seen			

$D_0^*(2400)^\pm$ REFERENCES				
LINK	04A	PL B586 11	J.M. Link <i>et al.</i>	(FOCUS Collab.)

 $D_1(2420)^0$ $I(J^P) = \frac{1}{2}(1^+)$
I needs confirmation.

$D_1(2420)^0$ MASS				
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2421.4±0.6 OUR FIT	Error includes scale factor of 1.2. [2421.3 ± 0.6 MeV OUR 2012 FIT Scale factor = 1.2]			
2421.1±0.7 OUR AVERAGE	Error includes scale factor of 1.2. [2420.9 ± 0.8 MeV OUR 2012 AVERAGE Scale factor = 1.2]			
2423.1±1.5 ^{+0.4} _{-1.0}	2.7k	¹ ABRAMOWICZ13 ZEUS $e^\pm p \rightarrow D^{(*)+} \pi^- X$		
2420.1±0.1±0.8	103k	DEL-AMO-SA..10P BABR $e^+ e^- \rightarrow D^{*+} \pi^- X$		
2426 ± 3 ± 1	151	ABE 05A BELL $B^- \rightarrow D^0 \pi^+ \pi^- \pi^-$		
2421.4±1.5±0.9	2 ABE	04D BELL $B^- \rightarrow D^{*+} \pi^- \pi^-$		
2421 ⁺¹ ₋₂ ± 2	286	AVERY 94C CLE2 $e^+ e^- \rightarrow D^{*+} \pi^- X$		
2422 ± 2 ± 2	51	FRABETTI 94B E687 $\gamma Be \rightarrow D^{*+} \pi^- X$		
2428 ± 3 ± 2	279	AVERY 90 CLEO $e^+ e^- \rightarrow D^{*+} \pi^- X$		
2414 ± 2 ± 5	171	ALBRECHT 89H ARG $e^+ e^- \rightarrow D^{*+} \pi^- X$		
2428 ± 8 ± 5	171	ANJOS 89C TPS $\gamma N \rightarrow D^{*+} \pi^- X$		

• • • We do not use the following data for averages, fits, limits, etc. • • •

2420.5±2.1±0.9	3110±340	³ CHEKANOV 09 ZEUS $e^\pm p \rightarrow D^{*+} \pi^- X$
2421.7±0.7±0.6	7.5k	ABULENCIA 06A CDF 1900 $p\bar{p} \rightarrow D^{*+} \pi^- X$
2425 ± 3	235	⁴ ABREU 98M DLPH $e^+ e^-$

¹ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

² Fit includes the contribution from $D_1^*(2430)^0$.

³ Calculated using the mass difference $m(D_1^0) - m(D^{*+})_{PDG}$ reported below and $m(D^{*+})_{PDG} = 2010.27 \pm 0.17$ MeV. The 0.17 MeV uncertainty of the PDG mass value should be added to the experimental uncertainty of 0.9 MeV.

⁴ No systematic error given.

NODE=M179

NODE=M179

NODE=M179M

NODE=M179M

NODE=M179W

NODE=M179W

NODE=M179215;NODE=M179

DESIG=1;OUR EVAL;→ UNCHECKED ←

NODE=M179

REFID=49775

NODE=M097

NODE=M097M

NODE=M097M

NODE=M097M

NEW

NEW

NODE=M097M;LINKAGE=AR

NODE=M097M;LINKAGE=AB

NODE=M097M;LINKAGE=CH

NODE=M097M;LINKAGE=K

$m_{D_1^0} - m_{D^{*+}}$

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
411.1±0.6 OUR FIT	Error includes scale factor of 1.2. Scale factor = 1.2]		[411.0 ± 0.6 OUR 2012 FIT	
411.5±0.8 OUR AVERAGE				
410.2±2.1±0.9	3110±340	CHEKANOV 09	ZEUS	$e^\pm p \rightarrow D^{*+}\pi^- X$
411.7±0.7±0.4	7.5k	ABULENCIA 06A	CDF	$p\bar{p} \rightarrow D^{*+}\pi^- X$

NODE=M097DM

NODE=M097DM

NODE=M097DM
NEW **$D_1(2420)^0$ WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
27.4± 2.5 OUR AVERAGE	Error includes scale factor of 2.3. See the ideogram below. [27.1 ± 2.7 MeV OUR 2012 AVERAGE Scale factor = 2.4]			

NODE=M097W

NODE=M097W
NEW

38.8± 5.0± 1.9	2.7k	5 ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)+}\pi^- X$
31.4± 0.5± 1.3	103k	DEL-AMO-SA...10P	BABR	$e^+ e^- \rightarrow D^{*+}\pi^- X$
20.0± 1.7± 1.3	7.5k	ABULENCIA 06A	CDF	$p\bar{p} \rightarrow D^{*+}\pi^- X$
24 ± 7 ± 8	151	ABE 05A	BELL	$B^- \rightarrow D^0\pi^+\pi^-\pi^-$
23.7± 2.7± 4.0	6 ABE	04D	BELL	$B^- \rightarrow D^{*+}\pi^-\pi^-$
20 ± 6 ± 3	286	AVERY 94C	CLE2	$e^+ e^- \rightarrow D^{*+}\pi^- X$
15 ± 8 ± 4	51	FRABETTI 94B	E687	$\gamma Be \rightarrow D^{*+}\pi^- X$
23 + 8 +10	279	AVERY 90	CLEO	$e^+ e^- \rightarrow D^{*+}\pi^- X$
13 ± 6 +10	171	ALBRECHT 89H	ARG	$e^+ e^- \rightarrow D^{*+}\pi^- X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

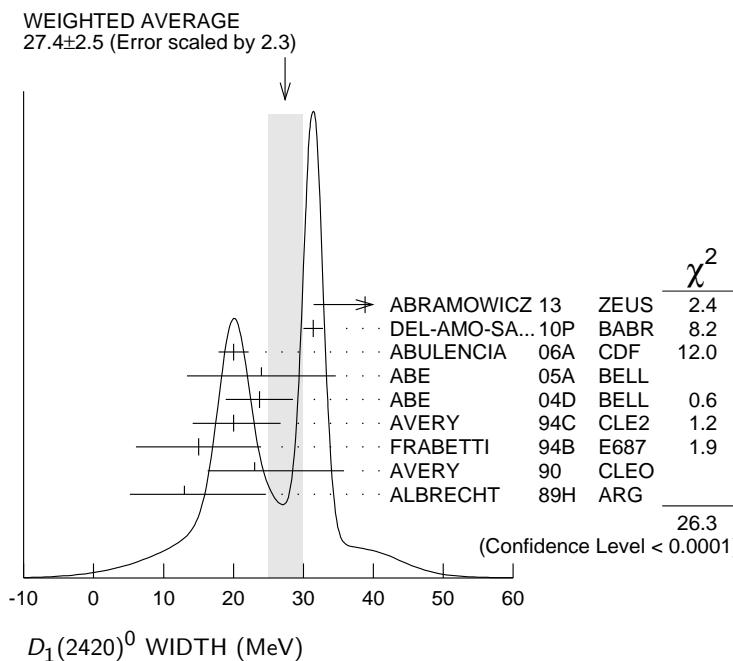
53.2± 7.2± 3.3	3110±340	CHEKANOV 09	ZEUS	$e^\pm p \rightarrow D^{*+}\pi^- X$
58 ±14 ±10	171	ANJOS	89C TPS	$\gamma N \rightarrow D^{*+}\pi^- X$

5 From the combined fit of the $M(D^+\pi^-)$ and $M(D^{*+}\pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

6 Fit includes the contribution from $D_1^*(2430)^0$.

NODE=M097W;LINKAGE=AR

NODE=M097W;LINKAGE=AB



$D_1(2420)^0$ DECAY MODES

$\overline{D}_1(2420)^0$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^*(2010)^+ \pi^-$	seen
$\Gamma_2 D^0 \pi^+ \pi^-$	seen
$\Gamma_3 D^0 \rho^0$	
$\Gamma_4 D^0 f_0(500)$	
$\Gamma_5 D_0^*(2400)^+ \pi^-$	
$\Gamma_6 D^+ \pi^-$	not seen
$\Gamma_7 D^{*0} \pi^+ \pi^-$	not seen

$D_1(2420)^0$ BRANCHING RATIOS

$\Gamma(D^*(2010)^+ \pi^-)/\Gamma_{\text{total}}$	Γ_1/Γ
VALUE	
seen	ACKERSTAFF 97W OPAL $e^+ e^- \rightarrow D^* + \pi^- X$
seen	AVERY 90 CLEO $e^+ e^- \rightarrow D^* + \pi^- X$
seen	ALBRECHT 89H ARG $e^+ e^- \rightarrow D^* \pi^- X$
seen	ANJOS 89C TPS $\gamma N \rightarrow D^* + \pi^- X$
$\Gamma(D^+ \pi^-)/\Gamma(D^*(2010)^+ \pi^-)$	Γ_6/Γ_1
VALUE	
CL%	
<0.24	90 AVERY 90 CLEO $e^+ e^- \rightarrow D^+ \pi^- X$

$D_1(2420)^0$ POLARIZATION AMPLITUDE A_{D_1}

A polarization amplitude A_{D_1} is a parameter that depends on the initial polarization of the D_1 and is sensitive to a possible S -wave contribution to its decay. For D_1 decays the helicity angle, θ_h , distribution varies like $1 + A_{D_1} \cos^2 \theta_h$, where θ_h is the angle in the D^* rest frame between the two pions emitted by the $D_1 \rightarrow D^* \pi$ and the $D^* \rightarrow D \pi$.

Unpolarized D_1 decaying purely via D -wave is predicted to give $A_{D_1} = 3$.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
5.73±0.25 OUR AVERAGE				
[5.72 ± 0.25 OUR 2012 AVERAGE]				
7.8 $+6.7$ -2.7	$+4.6$ -1.8	2.7k	7 ABRAMOWICZ13 ZEUS $e^\pm p \rightarrow D^*(*) + \pi^- X$	
5.72 ± 0.25		103k	DEL-AMO-SA..10P BABR $e^+ e^- \rightarrow D^* + \pi^- X$	
5.9 $+3.0$	$+2.4$		CHEKANOV 09 ZEUS $e^\pm p \rightarrow D^* + \pi^- X$	
5.9 -1.7	-1.0			
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.8 ± 0.6	± 0.8		8 AUBERT 09Y BABR $B^+ \rightarrow D_1^0 \ell^+ \nu_\ell$	
2.74 $+1.40$	-0.93		9 AVERY 94C CLE2 $e^+ e^- \rightarrow D^* + \pi^- X$	

⁷ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^* + \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1 . A pure D -wave not excluded although some S -wave mixing possible.

⁸ Assuming $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 1.065 \pm 0.026$ and equal partial widths and helicity angle distributions for charged and neutral D_1 mesons.

⁹ Systematic uncertainties not estimated.

$D_1(2420)^0$ REFERENCES

ABRAMOWICZ 13	NP B866 229	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
DEL-AMO-SA.. 10P	PR D82 111101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
AUBERT 09Y	PRL 103 051803	B. Aubert <i>et al.</i>	(BABAR Collab.)
CHEKANOV 09	EPJ C60 25	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
ABULENCIA 06A	PR D73 051104	A. Abulencia <i>et al.</i>	(CDF Collab.)
ABE 05A	PRL 94 221805	K. Abe <i>et al.</i>	(BELLE Collab.)
ABE 04D	PR D69 112002	K. Abe <i>et al.</i>	(BELLE Collab.)
ABREU 98M	PL B426 231	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF 97W	ZPHY C76 425	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
AVERY 94C	PL B331 236	P. Avery <i>et al.</i>	(CLEO Collab.)
FRABETTI 94B	PRL 72 324	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
AVERY 90	PR D41 774	P. Avery, D. Besson	(CLEO Collab.)
ALBRECHT 89H	PL B232 398	H. Albrecht <i>et al.</i>	(ARGUS Collab., JP)
ANJOS 89C	PRL 62 1717	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)

NODE=M097215;NODE=M097

NODE=M097

DESIG=1

DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=4

DESIG=5

DESIG=6

DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=7;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M097220

NODE=M097R1

NODE=M097R1

NODE=M097R2

NODE=M097R2

NODE=M097PAH

NODE=M097PAH

NODE=M097PAH

NEW

NODE=M097PAH;LINKAGE=AR

NODE=M097PAH;LINKAGE=AU

NODE=M097PAH;LINKAGE=AV

NODE=M097

REFID=54743

REFID=53534

REFID=52929

REFID=52733

REFID=51054

REFID=50755

REFID=50011

REFID=46315

REFID=45788

REFID=44096

REFID=43687

REFID=41013

REFID=41001

REFID=40737

$D_1(2420)^{\pm}$

$I(J^P) = \frac{1}{2}(?)$
/ needs confirmation.

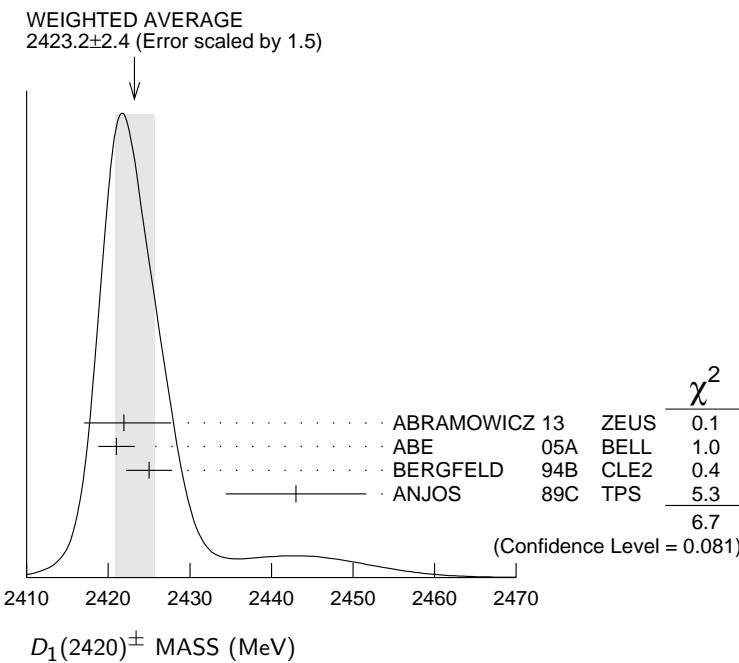
OMMITTED FROM SUMMARY TABLE

Seen in $D^*(2007)^0\pi^+$. $J^P = 0^+$ ruled out.

$D_1(2420)^{\pm}$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2423.2±2.4 OUR AVERAGE				Error includes scale factor of 1.5. See the ideogram below. [2423.4 ± 3.1 MeV OUR 2012 AVERAGE Scale factor = 1.8]
2421.9±4.7 ^{+3.4} _{-1.2}	759	1 ABRAMOWICZ13	ZEUS	$e^{\pm} p \rightarrow D^{(*)0}\pi^+ X$
2421 ± 2 ± 1	124	ABE	05A BELL	$\bar{B}^0 \rightarrow D^+\pi^+\pi^-\pi^-$
2425 ± 2 ± 2	146	BERGFELD	94B CLE2	$e^+ e^- \rightarrow D^{*0}\pi^+ X$
2443 ± 7 ± 5	190	ANJOS	89C TPS	$\gamma N \rightarrow D^0\pi^+ X^0$

¹ From the fit of the $M(D^0\pi^+)$ distribution. The widths of the D_1^+ and D_2^{*+} are fixed to 25 MeV and 37 MeV, and A_{D_1} and A_{D_2} are fixed to the theoretical predictions of 3 and -1, respectively.



$$m_{D_1^*(2420)^{\pm}} = m_{D_1^*(2420)^0}$$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
4⁺²₋₃±3	BERGFELD	94B CLE2	$e^+ e^- \rightarrow \text{hadrons}$

$D_1(2420)^{\pm}$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
25± 6 OUR AVERAGE				
21± 5±8	124	ABE	05A BELL	$\bar{B}^0 \rightarrow D^+\pi^+\pi^-\pi^-$
26 ^{+ 8} ₋₇ ±4	146	BERGFELD	94B CLE2	$e^+ e^- \rightarrow D^{*0}\pi^+ X$
41±19±8	190	ANJOS	89C TPS	$\gamma N \rightarrow D^0\pi^+ X^0$

NODE=M120

NODE=M120

NODE=M120M

NODE=M120M

NEW

NODE=M120M;LINKAGE=AB

NODE=M120DM

NODE=M120DM

NODE=M120W

NODE=M120W

$D_1(2420)^{\pm}$ DECAY MODES

$D_1^*(2420)^-$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^*(2007)^0 \pi^+$	seen
$\Gamma_2 D^+ \pi^+ \pi^-$	seen
$\Gamma_3 D^+ \rho^0$	
$\Gamma_4 D^+ f_0(500)$	
$\Gamma_5 D_0^*(2400)^0 \pi^+$	
$\Gamma_6 D^0 \pi^+$	not seen
$\Gamma_7 D^{*+} \pi^+ \pi^-$	not seen

$D_1(2420)^{\pm}$ BRANCHING RATIOS

$\Gamma(D^*(2007)^0 \pi^+)/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
seen	ANJOS 89C TPS $\gamma N \rightarrow D^0 \pi^+ X^0$
$\Gamma(D^0 \pi^+)/\Gamma(D^*(2007)^0 \pi^+)$	Γ_6/Γ_1
<u>VALUE</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.18	90 BERGFELD 94B CLE2 $e^+ e^- \rightarrow \text{hadrons}$

$D_1(2420)^{\pm}$ POLARIZATION AMPLITUDE A_{D_1}

A polarization amplitude A_{D_1} is a parameter that depends on the initial polarization of the D_1 and is sensitive to a possible S -wave contribution to its decay. For D_1 decays the helicity angle, θ_h , distribution varies like $1 + A_{D_1} \cos^2 \theta_h$, where θ_h is the angle in the D^* rest frame between the two pions emitted by the $D_1 \rightarrow D^* \pi$ and the $D^* \rightarrow D \pi$.

Unpolarized D_1 decaying purely via D -wave is predicted to give $A_{D_1} = 3$.

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$3.8 \pm 0.6 \pm 0.8$	² AUBERT 09Y BABR $B^0 \rightarrow D_1^- \ell^+ \nu_\ell$		
2 Assuming $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 1.065 \pm 0.026$ and equal partial widths and helicity angle distributions for charged and neutral D_1 mesons.			

$D_1(2420)^{\pm}$ REFERENCES

ABRAMOWICZ 13	NP B866 229	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
AUBERT 09Y	PRL 103 051803	B. Aubert <i>et al.</i>	(BABAR Collab.)
ABE 05A	PRL 94 221805	K. Abe <i>et al.</i>	(BELLE Collab.)
BERGFELD 94B	PL B340 194	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
ANJOS 89C	PRL 62 1717	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)

NODE=M120215;NODE=M120

NODE=M120

DESIG=1

DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=4

DESIG=5

DESIG=6

DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=7;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M120220

NODE=M120R1

NODE=M120R1

NODE=M120R2

NODE=M120R2

NODE=M120PAH

NODE=M120PAH

NODE=M120PAH

NODE=M120PAH;LINKAGE=AU

NODE=M120

REFID=54743

REFID=52929

REFID=50755

REFID=44099

REFID=40737

$D_1(2430)^0$

$$I(J^P) = \frac{1}{2}(1^+)$$

OMITTED FROM SUMMARY TABLE
 $J = 1^+$ assignment favored (ABE 04D).

 $D_1(2430)^0$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2427±26±25	ABE	04D	BELL $B^- \rightarrow D^*+\pi^-\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2477±28	¹ AUBERT	06L	BABR $\bar{B}^0 \rightarrow D^*+\omega\pi^-$

¹ Systematic errors not estimated.

NODE=M180

NODE=M180M

NODE=M180M

NODE=M180M;LINKAGE=AU

NODE=M180W

NODE=M180W

NODE=M180W;LINKAGE=AU

NODE=M180215;NODE=M180

DESIG=1;OUR EVAL;→ UNCHECKED ←

NODE=M180

REFID=51140
REFID=50011

NODE=M119

NODE=M119

NODE=M119M

NODE=M119M

NODE=M119M

NEW

NEW

 $D_2^*(2460)^0$

$$I(J^P) = \frac{1}{2}(2^+)$$

$J^P = 2^+$ assignment strongly favored(ALBRECHT 89B, ALBRECHT 89H), natural parity confirmed by the helicity analysis(DEL-AMO-SANCHEZ 10P),

 $D_2^*(2460)^0$ MASS

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2462.6±0.6 OUR FIT	Error includes scale factor of 1.2. [2462.6 ± 0.7 MeV OUR 2012 FIT Scale factor = 1.3]			
2461.8±0.7 OUR AVERAGE	Error includes scale factor of 1.1. [2461.8 ± 0.8 MeV OUR 2012 AVERAGE Scale factor = 1.2]			
2462.5±2.4 ^{+1.3} _{-1.1}	2.3k	¹ ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)}+\pi^-X$
2462.2±0.1±0.8	243k	DEL-AMO-SA..10P	BABR	$e^+e^- \rightarrow D^+\pi^-X$
2460.4±1.2±2.2	3.4k	AUBERT	09AB BABR	$B^- \rightarrow D^+\pi^-\pi^-$
2461.6±2.1±3.3	² ABE	04D	BELL	$B^- \rightarrow D^+\pi^-\pi^-$
2464.5±1.1±1.9	5.8k	² LINK	04A FOCS	γA
2465 ± 3 ± 3	486	AVERY	94C CLE2	$e^+e^- \rightarrow D^+\pi^-X$
2453 ± 3 ± 2	128	FRABETTI	94B E687	$\gamma Be \rightarrow D^+\pi^-X$
2461 ± 3 ± 1	440	AVERY	90 CLEO	$e^+e^- \rightarrow D^{*+}\pi^-X$
2455 ± 3 ± 5	337	ALBRECHT	89B ARG	$e^+e^- \rightarrow D^+\pi^-X$
2459 ± 3 ± 2	153	ANJOS	89C TPS	$\gamma N \rightarrow D^+\pi^-X$

|

• • • We do not use the following data for averages, fits, limits, etc. • • •

2469.1 \pm 3.7 $^{+1.2}_{-1.3}$	1560 \pm 230	³ CHEKANOV	09	ZEUS	$e^{\pm} p \rightarrow D^{(*)} + \pi^- X$
2463.3 \pm 0.6 \pm 0.8	20k	ABULENCIA	06A	CDF	$1900 p\bar{p} \rightarrow D^+ \pi^- X$
2461 \pm 6	126	⁴ ABREU	98M	DLPH	$e^+ e^-$
2466 \pm 7	1	ASRATYAN	95	BEBC	$53,40 \nu(\bar{\nu}) \rightarrow pX, dX$

¹ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1 .

² Fit includes the contribution from $D_0^*(2400)^0$.

³ Calculated using the mass difference $m(D_2^{*0}) - m(D^{*+})_{PDG}$ reported below and $m(D^{*+})_{PDG} = 2010.27 \pm 0.17$ MeV. The 0.17 MeV uncertainty of the PDG mass value should be added to the experimental uncertainty of $^{+1.2}_{-1.3}$ MeV.

⁴ No systematic error given.

NODE=M119M;LINKAGE=AR

NODE=M119M;LINKAGE=LI

NODE=M119M;LINKAGE=CH

NODE=M119M;LINKAGE=K

NODE=M119DM

NODE=M119DM

NODE=M119DM

NEW

NODE=M119DM2

NODE=M119DM2

NODE=M119DM2

NEW

NODE=M119W

NODE=M119W

NEW

$m_{D_2^{*0}} - m_{D^{*+}}$

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
593.0 \pm 0.6 OUR FIT	Error includes scale factor of 1.3. FIT Scale factor = 1.3]		[593.0 \pm 0.7 MeV OUR 2012	
593.9 \pm 0.6 \pm 0.5	20k	ABULENCIA	06A CDF	$1900 p\bar{p} \rightarrow D^+ \pi^- X$

$m_{D_2^{*0}} = m_{D^{*+}}$

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
452.3 \pm 0.6 OUR FIT	Error includes scale factor of 1.3. FIT Scale factor = 1.3]		[452.3 \pm 0.7 MeV OUR 2012	
458.8 \pm 3.7 $^{+1.2}_{-1.3}$	1560 \pm 230	CHEKANOV	09 ZEUS	$e^{\pm} p \rightarrow D^{(*)} + \pi^- X$

$D_2^*(2460)^0$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
49.0 \pm 1.3 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below. [49.0 \pm 1.4 MeV OUR 2012 AVERAGE Scale factor = 1.7]			
46.6 \pm 8.1 $^{+5.9}_{-3.8}$	2.3k	⁵ ABRAMOWICZ13	ZEUS	$e^{\pm} p \rightarrow D^{(*)} + \pi^- X$
50.5 \pm 0.6 \pm 0.7	243k	DEL-AMO-SA..10P	BABR	$e^+ e^- \rightarrow D^+ \pi^- X$
41.8 \pm 2.5 \pm 2.9	3.4k	AUBERT	09AB BABR	$B^- \rightarrow D^+ \pi^- \pi^-$
49.2 \pm 2.3 \pm 1.3	20k	ABULENCIA	06A CDF	$1900 p\bar{p} \rightarrow D^+ \pi^- X$
45.6 \pm 4.4 \pm 6.7	⁶ ABE	04D BELL		$B^- \rightarrow D^+ \pi^- \pi^-$
38.7 \pm 5.3 \pm 2.9	5.8k	⁶ LINK	04A FOCS	γA
28 \pm 8 \pm 6	486	AVERY	94C CLE2	$e^+ e^- \rightarrow D^+ \pi^- X$
25 \pm 10 \pm 5	128	FRABETTI	94B E687	$\gamma Be \rightarrow D^+ \pi^- X$
20 \pm 9 \pm 9	440	AVERY	90 CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$
15 \pm 13 \pm 5	337	ALBRECHT	89B ARG	$e^+ e^- \rightarrow D^+ \pi^- X$
20 \pm 10 \pm 5	153	ANJOS	89C TPS	$\gamma N \rightarrow D^+ \pi^- X$

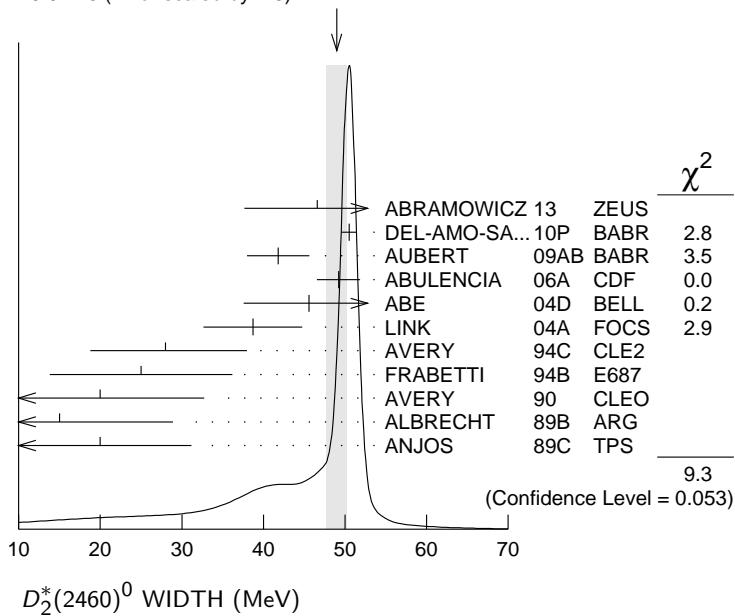
⁵ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1 .

⁶ Fit includes the contribution from $D_0^*(2400)^0$.

NODE=M119W;LINKAGE=AR

NODE=M119W;LINKAGE=LI

WEIGHTED AVERAGE
49.0±1.3 (Error scaled by 1.5)



$D_2^*(2460)^0$ DECAY MODES

$\overline{D}_2^*(2460)^0$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^+ \pi^-$	seen
$\Gamma_2 D^*(2010)^+ \pi^-$	seen
$\Gamma_3 D^0 \pi^+ \pi^-$	not seen
$\Gamma_4 D^{*0} \pi^+ \pi^-$	not seen

$D_2^*(2460)^0$ BRANCHING RATIOS

$\Gamma(D^+ \pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
seen	3.4k	AUBERT	09AB	$B^- \rightarrow D^+ \pi^- \pi^-$	
seen	337	ALBRECHT	89B	$e^+ e^- \rightarrow D^+ \pi^- X$	
seen		ANJOS	89C	$\gamma N \rightarrow D^+ \pi^- X$	

$\Gamma(D^*(2010)^+ \pi^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
seen	ACKERSTAFF 97W	OPAL	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
seen	AVERY 90	CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$	
seen	ALBRECHT 89H	ARG	$e^+ e^- \rightarrow D^* \pi^- X$	

$\Gamma(D^+ \pi^-)/\Gamma(D^*(2010)^+ \pi^-)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ_2
1.54±0.15 OUR AVERAGE [1.56 ± 0.16 OUR 2012 AVERAGE]					

1.4 ± 0.3 ± 0.3	2.3k	7 ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)+} \pi^- \pi^- X$
1.47±0.03±0.16	379k	DEL-AMO-SA...10P	BABR	$e^+ e^- \rightarrow D^{(*)+} \pi^- X$
2.8 ± 0.8 ± 0.5	1560±230	CHEKANOV 09	ZEUS	$e^\pm p \rightarrow D^{(*)+} \pi^- \pi^- X$
2.2 ± 0.7 ± 0.6		AVERY 94C	CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$
2.3 ± 0.8		AVERY 90	CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$
3.0 ± 1.1 ± 1.5		ALBRECHT 89H	ARG	$e^+ e^- \rightarrow D^* \pi^- X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.9 ± 0.5 ABE 04D BELL $B^- \rightarrow D^{(*)+} \pi^- \pi^-$

⁷ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

NODE=M119215;NODE=M119

NODE=M119

CLUMP=A;DESIG=1

DESIG=2

DESIG=3;OUR EST;→ UNCHECKED ←
DESIG=4;OUR EST;→ UNCHECKED ←

NODE=M119220

NODE=M119R1
NODE=M119R1

NODE=M119R2
NODE=M119R2

NODE=M119R3
NODE=M119R3
NEW

NODE=M119R3;LINKAGE=AR

$\Gamma(D^+\pi^-)/[\Gamma(D^+\pi^-) + \Gamma(D^*(2010)^+\pi^-)]$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.62±0.03±0.02	8414	⁸ AUBERT	09Y BABR	$B^+ \rightarrow D_2^{*0} \ell^+ \nu_\ell$
⁸ Assuming $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 1.065 \pm 0.026$ and equal partial widths for charged and neutral D_2^* mesons.				

 $\Gamma_1/(\Gamma_1 + \Gamma_2)$

NODE=M119R01
NODE=M119R01

 $D_2^*(2460)^0$ POLARIZATION AMPLITUDE A_{D_2}

A polarization amplitude A_{D_2} is a parameter that depends on the initial polarization of the D_2 . For D_2 decays the helicity angle, θ_H , distribution varies like $1 + A_{D_2} \cos^2(\theta_H)$, where θ_H is the angle in the D^* rest frame between the two pions emitted by the $D_2 \rightarrow D^* \pi$ and $D^* \rightarrow D\pi$.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-1.16±0.35	2.3k	⁹ ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)+} \pi^- X$
consistent with -1	243k	DEL-AMO-SA..10P	BABR	$e^+ e^- \rightarrow D^+ \pi^- X$
-0.74 ^{+0.49} _{-0.38}	10	AVERY	94C CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$

NODE=M119PAM

NODE=M119PAM

NODE=M119PAM

⁹ From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions.
10 Systematic uncertainties not estimated.

NODE=M119PAM;LINKAGE=AB
NODE=M119PAM;LINKAGE=AV

 $D_2^*(2460)^0$ REFERENCES

ABRAMOWICZ 13	NP B866 229	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
DEL-AMO-SA... 10P	PR D82 111101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
AUBERT 09AB	PR D79 112004	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 09Y	PRL 103 051803	B. Aubert <i>et al.</i>	(BABAR Collab.)
CHEKANOV 09	EPJ C60 25	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
ABULENCIA 06A	PR D73 051104	A. Abulencia <i>et al.</i>	(CDF Collab.)
ABE 04D	PR D69 112002	K. Abe <i>et al.</i>	(BELLE Collab.)
LINK 04A	PL B586 11	J.M. Link <i>et al.</i>	(FOCUS Collab.)
ABREU 98M	PL B426 231	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF 97W	ZPHY C76 425	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
ASRATYAN 95	ZPHY C68 43	A.E. Asratyan <i>et al.</i>	(BIRM, BELG, CERN+) (CLEO Collab.)
AVERY 94C	PL B331 236	P. Avery <i>et al.</i>	(FNAL E687 Collab.)
FRAZETTI 94B	PRL 72 324	P.L. Frabetti <i>et al.</i>	(CLEO Collab.)
AVERY 90	PR D41 774	P. Avery, D. Besson	(ARGUS Collab.) JP
ALBRECHT 89B	PL B221 422	H. Albrecht <i>et al.</i>	(ARGUS Collab.) JP
ALBRECHT 89H	PL B232 398	H. Albrecht <i>et al.</i>	(ARGUS Collab.) JP
ANJOS 89C	PRL 62 1717	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)

NODE=M119

REFID=54743
REFID=53534
REFID=52941
REFID=52929
REFID=52733
REFID=51054
REFID=50011
REFID=49775
REFID=46315
REFID=45788
REFID=44439
REFID=44096
REFID=43687
REFID=41013
REFID=40736
REFID=41001
REFID=40737

$D_2^*(2460)^\pm$

$I(J^P) = \frac{1}{2}(2^+)$

$J^P = 2^+$ assignment strongly favored(ALBRECHT 89B).

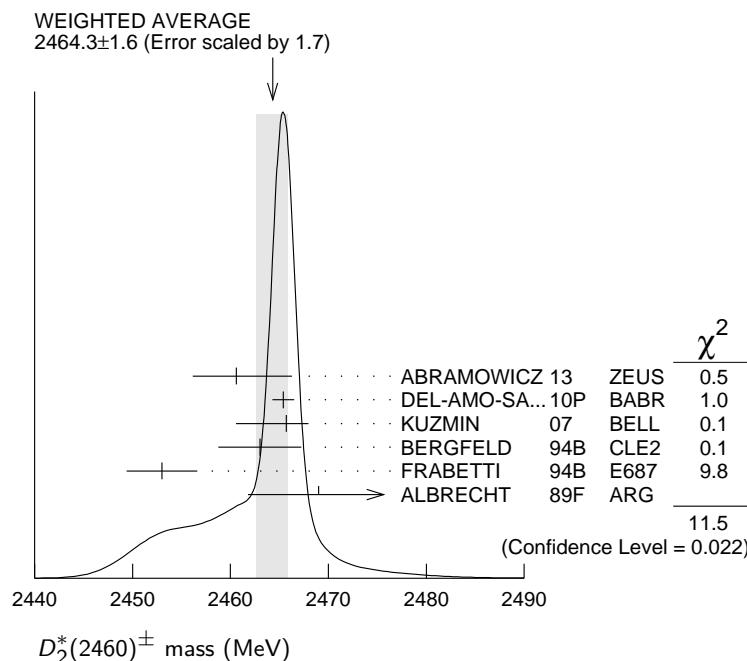
$D_2^*(2460)^\pm$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2464.3±1.6 OUR AVERAGE				Error includes scale factor of 1.7. See the ideogram below. [2464.4 ± 1.9 MeV OUR 2012 AVERAGE Scale factor = 1.9]
2460.6±4.4 ^{+3.6} _{-0.8}	1371	1 ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)} 0 \pi^+ X$
2465.4±0.2±1.1	111k	2 DEL-AMO-SA...10P	BABR	$e^+ e^- \rightarrow D^0 \pi^+ X$
2465.7±1.8 ^{+1.4} _{-4.8}	2909	KUZMIN	07	BELL $e^+ e^- \rightarrow \text{hadrons}$
2463 ± 3 ± 3	310	BERGFELD	94B CLE2	$e^+ e^- \rightarrow D^0 \pi^+ X$
2453 ± 3 ± 2	185	FRABETTI	94B E687	$\gamma \text{Be} \rightarrow D^0 \pi^+ X$
2469 ± 4 ± 6		ALBRECHT	89F ARG	$e^+ e^- \rightarrow D^0 \pi^+ X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2467.6±1.5±0.8	3.5k	³ LINK	04A FOCS	γA

¹ From the fit of the $M(D^0 \pi^+)$ distribution. The widths of the D_1^+ and D_2^{*+} are fixed to 25 MeV and 37 MeV, and A_{D_1} and A_{D_2} are fixed to the theoretical predictions of 3 and -1, respectively.

² At a fixed width of 50.5 MeV.

³ Fit includes the contribution from $D_0^*(2400)^\pm$. Not independent of the corresponding mass difference measurement, $(m_{D_2^*(2460)^\pm}) - (m_{D_2^*(2460)^0})$.



$m_{D_2^*(2460)^\pm} - m_{D_2^*(2460)^0}$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2.4±1.7 OUR AVERAGE			
3.1±1.9±0.9	LINK	04A FOCS	γA
- 2 ± 4 ± 4	BERGFELD	94B CLE2	$e^+ e^- \rightarrow \text{hadrons}$
0 ± 4	FRABETTI	94B E687	$\gamma \text{Be} \rightarrow D \pi X$
14 ± 5 ± 8	ALBRECHT	89F ARG	$e^+ e^- \rightarrow D^0 \pi^+ X$

$D_2^*(2460)^\pm$ WIDTH

NODE=M150

NODE=M150

NODE=M150M

NODE=M150M

NEW

NODE=M150M;LINKAGE=AB

NODE=M150M;LINKAGE=DE

NODE=M150M;LINKAGE=LI

NODE=M150DM

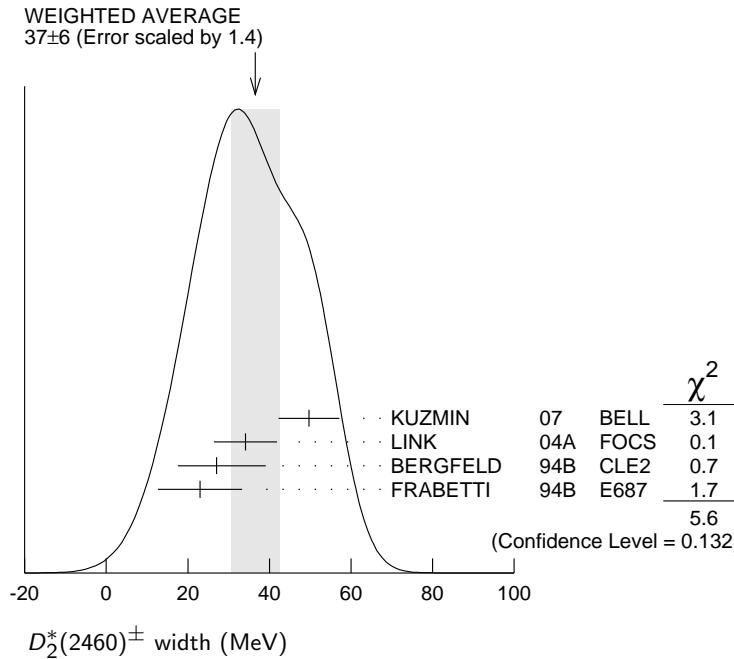
NODE=M150DM

NODE=M150W

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
37 ± 6 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below.
49.7± 3.8±6.4	2909	KUZMIN	07	BELL $e^+ e^- \rightarrow \text{hadrons}$
34.1± 6.5±4.2	3.5k	4 LINK	04A	FOCS γA
27 ± 11 ± 5	310	BERGFELD	94B	CLE2 $e^+ e^- \rightarrow D^0 \pi^+ X$
23 ± 9 ± 5	185	FRABETTI	94B	E687 $\gamma Be \rightarrow D^0 \pi^+ X$

⁴ Fit includes the contribution from $D_0^*(2400)^\pm$.

NODE=M150W



NODE=M150W;LINKAGE=LI

$D_2^*(2460)^\pm$ DECAY MODES

$D_2^*(2460)^-$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^0 \pi^+$	seen
$\Gamma_2 D^{*0} \pi^+$	seen
$\Gamma_3 D^+ \pi^+ \pi^-$	not seen
$\Gamma_4 D^{*+} \pi^+ \pi^-$	not seen

NODE=M150215;NODE=M150

NODE=M150

$D_2^*(2460)^\pm$ BRANCHING RATIOS

$\Gamma(D^0 \pi^+)/\Gamma_{\text{total}}$		Γ_1/Γ
seen	ALBRECHT	89F ARG $e^+ e^- \rightarrow D^0 \pi^+ X$

DESIG=1

DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow
 DESIG=4;OUR EST; \rightarrow UNCHECKED \leftarrow

NODE=M150220

NODE=M150R1
NODE=M150R1

$\Gamma(D^0 \pi^+)/\Gamma(D^{*0} \pi^+)$		Γ_1/Γ_2
1.2±0.4 OUR AVERAGE		
[1.9 ± 1.1 OUR 2012 AVERAGE]		
1.1±0.4 ^{+0.3} _{-0.2}	1371	5 ABRAMOWICZ13 ZEUS $e^\pm p \rightarrow D^{(*)0} \pi^+ X$
1.9±1.1±0.3		BERGFELD 94B CLE2 $e^+ e^- \rightarrow \text{hadrons}$

NODE=M150R2
NODE=M150R2
NEW

⁵ From the fit of the $M(D^0 \pi^+)$ distribution. The widths of the D_1^+ and D_2^{*+} are fixed to 25 MeV and 37 MeV, and A_{D_1} and A_{D_2} are fixed to the theoretical predictions of 3 and -1, respectively.

NODE=M150R2;LINKAGE=AB

$\Gamma(D^0\pi^+)/[\Gamma(D^0\pi^+) + \Gamma(D^{*0}\pi^+)]$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.62 \pm 0.03 \pm 0.02$	3361	⁶ AUBERT	09Y BABR	$\bar{B}^0 \rightarrow D_2^{*+} \ell^- \nu_\ell$
⁶ Assuming $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 1.065 \pm 0.026$ and equal partial widths for charged and neutral D_2^* mesons.				

 $\Gamma_1/(\Gamma_1 + \Gamma_2)$ NODE=M150R01
NODE=M150R01 **$D_2^*(2460)^{\pm}$ REFERENCES**

ABRAMOWICZ 13	NP B866 229	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
DEL-AMO-SA... 10P	PR D82 111101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
AUBERT 09Y	PR D103 051803	B. Aubert <i>et al.</i>	(Babar Collab.)
KUZMIN 07	PR D76 012006	A. Kuzmin <i>et al.</i>	(BELLE Collab.)
LINK 04A	PL B586 11	J.M. Link <i>et al.</i>	(FOCUS Collab.)
BERGFELD 94B	PL B340 194	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
FRABETTI 94B	PRL 72 324	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
ALBRECHT 89B	PL B221 422	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT 89F	PL B231 208	H. Albrecht <i>et al.</i>	(ARGUS Collab.)

 $D(2550)^0$

$I(J^P) = \frac{1}{2}(0^-)$

OMITTED FROM SUMMARY TABLE

 $J^P = 0^-$ assignment based on the helicity analysis (DEL-AMO-SANCHEZ 10P). **$D(2550)^0$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$2539.4 \pm 4.5 \pm 6.8$	34k	DEL-AMO-SA...10P	BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$

 $D(2550)^0$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$130 \pm 12 \pm 13$	34k	DEL-AMO-SA...10P	BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$

 $D(2550)^0$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^{*+} \pi^-$	seen

 $D(2550)^0$ REFERENCESDEL-AMO-SA... 10P PR D82 111101 P. del Amo Sanchez *et al.* (BABAR Collab.)

NODE=M150

REFID=54743
REFID=53534
REFID=52929
REFID=51854
REFID=49775
REFID=44099
REFID=43687
REFID=40736
REFID=40931

NODE=M198

NODE=M198

NODE=M198M

NODE=M198M

NODE=M198W

NODE=M198W

NODE=M198215; NODE=M198

DESIG=1; OUR EVAL; → UNCHECKED ←

NODE=M198

REFID=53534

D(2600) $I(J^P) = \frac{1}{2}(?)$

OMITTED FROM SUMMARY TABLE
 J^P consistent with natural parity (DEL-AMO-SANCHEZ 10P).

D(2600) MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
2612 ± 6 OUR AVERAGE					Error includes scale factor of 1.9.
2608.7 ± 2.4 ± 2.5	26k	DEL-AMO-SA..10P	BABR	0	$e^+ e^- \rightarrow D^+ \pi^- X$
2621.3 ± 3.7 ± 4.2	13k	¹ DEL-AMO-SA..10P	BABR	+	$e^+ e^- \rightarrow D^0 \pi^+ X$

¹ At a fixed width of 93 MeV.**D(2600) WIDTH**

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
93 ± 6 ± 13	26k	DEL-AMO-SA..10P	BABR	$e^+ e^- \rightarrow D^+ \pi^- X$

D(2600) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D\pi$	seen
$\Gamma_2 D^+\pi^-$	seen
$\Gamma_3 D^0\pi^\pm$	seen
$\Gamma_4 D^*\pi$	seen
$\Gamma_5 D^{*+}\pi^-$	seen

D(2600) BRANCHING RATIOS

$\Gamma(D^+\pi^-)/\Gamma(D^{*+}\pi^-)$	Γ_2/Γ_5
0.32 ± 0.02 ± 0.09	76k DEL-AMO-SA..10P BABR $e^+ e^- \rightarrow D^{(*)+} \pi^- X$

D(2600) REFERENCES

DEL-AMO-SA... 10P PR D82 111101 P. del Amo Sanchez *et al.* (BABAR Collab.)

NODE=M199

NODE=M199M

NODE=M199M

OCCUR=2

NODE=M199M;LINKAGE=DE

NODE=M199W

NODE=M199W

NODE=M199215;NODE=M199

DESIG=1;OUR EVAL; \rightarrow UNCHECKED \leftarrow
 DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow
 DESIG=3;OUR EVAL; \rightarrow UNCHECKED \leftarrow
 DESIG=4;OUR EVAL; \rightarrow UNCHECKED \leftarrow
 DESIG=5;OUR EVAL; \rightarrow UNCHECKED \leftarrow

NODE=M199220

NODE=M199R01
NODE=M199R01

NODE=M199

REFID=53534

$D^*(2640)^{\pm}$ $I(J^P) = \frac{1}{2}(?)$

OMITTED FROM SUMMARY TABLE

Seen in Z decays by ABREU 98M. Not seen by ABBIENDI 01N and CHEKANOV 09. Needs confirmation.

$D^*(2640)^{\pm}$ MASS					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2637±2±6	66 ± 14	ABREU	98M DLPH	$e^+ e^- \rightarrow D^* + \pi^+ \pi^- X$	

$D^*(2640)^{\pm}$ WIDTH					
VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT	
<15	95	ABREU	98M DLPH	$e^+ e^- \rightarrow D^* + \pi^+ \pi^- X$	

 $D^*(2640)^+$ DECAY MODES

$D^*(2640)^-$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^*(2010)^+ \pi^+ \pi^-$	seen

 $D^*(2640)^{\pm}$ REFERENCES

CHEKANOV 09	EPJ C60 25	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
ABBIENDI 01N	EPJ C20 445	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABREU 98M	PL B426 231	P. Abreu <i>et al.</i>	(DELPHI Collab.)

 $D(2750)$ $I(J^P) = \frac{1}{2}(?)$

OMITTED FROM SUMMARY TABLE

 $D(2750)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
2761 ±5 OUR AVERAGE					Error includes scale factor of 2.5. See the ideogram below.
2752.4±1.7±2.7	23.5k	1 DEL-AMO-SA..10P	BABR 0	$e^+ e^- \rightarrow D^* + \pi^- X$	
2763.3±2.3±2.3	11.3k	1 DEL-AMO-SA..10P	BABR 0	$e^+ e^- \rightarrow D^+ + \pi^- X$	
2769.7±3.8±1.5	5.7k	1,2 DEL-AMO-SA..10P	BABR +	$e^+ e^- \rightarrow D^0 + \pi^+ X$	

¹ The states observed in the $D^*\pi$ and $D\pi$ final states are not necessarily the same.

² At a fixed width of 60.9 MeV.

NODE=M158

NODE=M158

NODE=M158M

NODE=M158M

NODE=M158W

NODE=M158W

NODE=M158215;NODE=M158

NODE=M158

DESIG=1;OUR EST;→ UNCHECKED ←

NODE=M158

REFID=52733
REFID=48296
REFID=46315

NODE=M203

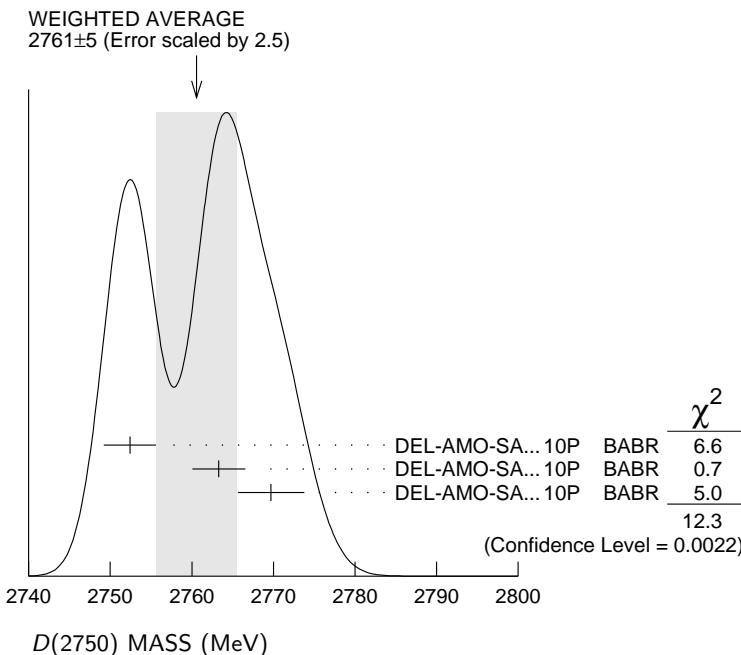
NODE=M203M

NODE=M203M

OCCUR=2

OCCUR=3

NODE=M203M;LINKAGE=DE
NODE=M203M;LINKAGE=DA



D(2750) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
63 ±6 OUR AVERAGE				
71 ±6 ±11	23.5k	3 DEL-AMO-SA..10P BABR	e ⁺ e ⁻ → D [*] + π ⁻ X	
60.9±5.1± 3.6	11.3k	3 DEL-AMO-SA..10P BABR	e ⁺ e ⁻ → D ⁺ π ⁻ X	

³ The states observed in the D^{*} π and Dπ final states are not necessarily the same.

D(2750) DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 Dπ	seen
Γ_2 D ⁺ π ⁻	seen
Γ_3 D ⁰ π [±]	seen
Γ_4 D [*] π	seen
Γ_5 D [*] + π ⁻	seen

D(2750) BRANCHING RATIOS

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_5
0.42±0.05±0.11	34.8k	4 DEL-AMO-SA..10P BABR	e ⁺ e ⁻ → D ^(*) + π ⁻ X		

⁴ The states observed in the D^{*} π and Dπ final states are not necessarily the same.

D(2750) POLARIZATION AMPLITUDE A_D

A polarization amplitude A_D is a parameter that depends on the initial polarization of the D(2750). For D(2750) decays the helicity angle, θ_H , distribution varies like $1 + A_D \cos(\theta_H)$, where θ_H is the angle in the D^{*} rest frame between the two pions emitted by the D(2750) → D^{*} π and D^{*} → Dπ.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
⁵ Systematic uncertainties not estimated. The states observed in the D [*] π and Dπ final states are not necessarily the same.				

D(2750) REFERENCES

NODE=M203W

NODE=M203W

OCCUR=2

NODE=M203W;LINKAGE=DE

NODE=M203215;NODE=M203

DESIG=1;OUR EVAL;→ UNCHECKED ←
 DESIG=2;OUR EVAL;→ UNCHECKED ←
 DESIG=3;OUR EVAL;→ UNCHECKED ←
 DESIG=4;OUR EVAL;→ UNCHECKED ←
 DESIG=5;OUR EVAL;→ UNCHECKED ←

NODE=M203220

NODE=M203R01

NODE=M203R01

NODE=M203R01;LINKAGE=DE

NODE=M203PAM

NODE=M203PAM

NODE=M203PAM

NODE=M203PAM;LINKAGE=DE

NODE=M203

REFID=53534

CHARMED, STRANGE MESONS ($C = S = \pm 1$)

$D_s^+ = c\bar{s}$, $D_s^- = \bar{c}s$, similarly for $D_s^{*\pm}$

$D_s^{*\pm}$

$I(J^P) = 0(?)$

J^P is natural, width and decay modes consistent with 1^- .

$D_s^{*\pm}$ MASS

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2112.3±0.5 OUR FIT	Error includes scale factor of 1.1.		
2106.6±2.1±2.7	¹ BLAYLOCK 87 MRK3 $e^+ e^- \rightarrow D_s^\pm \gamma X$		

¹ Assuming D_s^\pm mass = 1968.7 ± 0.9 MeV.

$m_{D_s^{*\pm}} - m_{D_s^\pm}$

The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
143.8 ± 0.4 OUR FIT				
143.9 ± 0.4 OUR AVERAGE				
143.76 ± 0.39 ± 0.40		GRONBERG 95	CLE2	$e^+ e^-$
144.22 ± 0.47 ± 0.37		BROWN 94	CLE2	$e^+ e^-$
142.5 ± 0.8 ± 1.5		² ALBRECHT 88	ARG	$e^+ e^- \rightarrow D_s^\pm \gamma X$
139.5 ± 8.3 ± 9.7	60	AIHARA 84D	TPC	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
143.0 ± 18.0	8	ASRATYAN 85	HLBC	FNAL 15-ft, $\nu^- H$
110 ± 46		BRANDELIK 79	DASP	$e^+ e^- \rightarrow D_s^\pm \gamma X$

² Result includes data of ALBRECHT 84B.

$D_s^{*\pm}$ WIDTH

VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT
< 1.9	90	GRONBERG 95	CLE2	$e^+ e^-$
< 4.5	90	ALBRECHT 88	ARG	$E_{cm}^{ee} = 10.2$ GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 4.9	90	BROWN 94	CLE2	$e^+ e^-$
< 22	90	BLAYLOCK 87	MRK3	$e^+ e^- \rightarrow D_s^\pm \gamma X$

D_s^{*+} DECAY MODES

D_s^{*-} modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D_s^+ \gamma$	(94.2 ± 0.7) %
$\Gamma_2 D_s^+ \pi^0$	(5.8 ± 0.7) %

NODE=MXXX040

NODE=MXXX040

NODE=S074

NODE=S074

NODE=S074M

NODE=S074M

NODE=S074M

NODE=S074M;LINKAGE=E

NODE=S074DM

NODE=S074DM

NODE=S074DM

NODE=S074DM;LINKAGE=A

NODE=S074W

NODE=S074W

NODE=S074215;NODE=S074

NODE=S074

DESIG=1

DESIG=2

CONSTRAINED FIT INFORMATION

An overall fit to a branching ratio uses 2 measurements and one constraint to determine 2 parameters. The overall fit has a $\chi^2 = 0.0$ for 1 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	-100
x_1	

D_s^{*+} BRANCHING RATIOS

$\Gamma(D_s^+ \gamma) / \Gamma_{\text{total}}$

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT	Γ_1 / Γ
0.942 ± 0.007 OUR FIT					

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.942 ± 0.004 ± 0.006	16k	³ AUBERT,BE	05G BABR	10.6 $e^+ e^- \rightarrow$ hadrons	
seen		ASRATYAN	91	HLBC $\bar{\nu}_\mu$ Ne	
seen		ALBRECHT	88	ARG $e^+ e^- \rightarrow D_s^\pm \gamma X$	
seen		AIHARA	84D		
seen		ALBRECHT	84B		
seen		BRANDELIK	79		

$\Gamma(D_s^+ \pi^0) / \Gamma_{\text{total}}$

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT	Γ_2 / Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •					

0.059 ± 0.004 ± 0.006	560	³ AUBERT,BE	05G BABR	10.6 $e^+ e^- \rightarrow$ hadrons	
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$\Gamma(D_s^+ \pi^0) / \Gamma(D_s^+ \gamma)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2 / Γ_1
0.062 ± 0.008 OUR FIT				

0.062 ± 0.008 OUR AVERAGE

0.062 ± 0.005 ± 0.006	AUBERT,BE	05G BABR	10.6 $e^+ e^- \rightarrow$ hadrons	
0.062 ^{+0.020} _{-0.018} ± 0.022	GRONBERG	95 CLE2	$e^+ e^-$	

³ Derived from the ratio $\Gamma(D_s^+ \pi^0) / \Gamma(D_s^+ \gamma)$ assuming that the branching fractions of $D_s^{*+} \rightarrow D_s^+ \pi^0$ and $D_s^{*+} \rightarrow D_s^+ \gamma$ decays sum to 100%.

NODE=S074220

NODE=S074R1

NODE=S074R1

$D_s^{*\pm}$ REFERENCES

AUBERT,BE	05G	PR D72 091101	B. Aubert <i>et al.</i>	(BABAR Collab.)
GRONBERG	95	PRL 75 3232	J. Gronberg <i>et al.</i>	(CLEO Collab.)
BROWN	94	PR D50 1884	D. Brown <i>et al.</i>	(CLEO Collab.)
ASRATYAN	91	PL B257 525	A.E. Asratyan <i>et al.</i>	(ITEP, BELG, SACL+)
ALBRECHT	88	PL B207 349	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BLAYLOCK	87	PRL 58 2171	G.T. Blaylock <i>et al.</i>	(Mark III Collab.)
ASRATYAN	85	PL 156B 441	A.E. Asratyan <i>et al.</i>	(ITEP, SERP)
AIHARA	84D	PRL 53 2465	H. Aihara <i>et al.</i>	(TPC Collab.)
ALBRECHT	84B	PL 146B 111	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BRANDELIK	79	PL 80B 412	R. Brandelik <i>et al.</i>	(DASP Collab.)

NODE=S074R;LINKAGE=AU

REFID=50942

REFID=44568

REFID=43868

REFID=41582

REFID=40269

REFID=40005

REFID=22887

REFID=11561

REFID=11442

REFID=22886

REFID=11442

NODE=S074

$D_{s0}^*(2317)^\pm$
 $I(J^P) = 0(0^+)$
 J, P need confirmation.

AUBERT 06P does not observe neutral and doubly charged partners of the $D_{s0}^*(2317)^\pm$.

 $D_{s0}^*(2317)^\pm$ MASS

The fit includes $D^\pm, D^0, D_s^\pm, D^{*\pm}, D^{*0}, D_s^{*\pm}, D_1(2420)^0, D_2^{*}(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2317.8±0.6 OUR FIT				Error includes scale factor of 1.1.
2318.0±1.0 OUR AVERAGE				Error includes scale factor of 1.4.
2319.6±0.2±1.4	3180	AUBERT	06P BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^0 X$
2317.3±0.4±0.8	1022	¹ AUBERT	04E BABR	$10.6 e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2317.2±1.3	88	² AUBERT,B	04S BABR	$B \rightarrow D_{s0}^{(*)}(2317) + \bar{D}^{(*)}$
2317.2±0.5±0.9	761	³ MIKAMI	04 BELL	$10.6 e^+ e^-$
2316.8±0.4±3.0	1267 ± 53	^{3,4} AUBERT	03G BABR	$10.6 e^+ e^-$
2317.6±1.3	273 ± 33	^{3,5} AUBERT	03G BABR	$10.6 e^+ e^-$
2319.8±2.1±2.0	24	³ KROKOVNY	03B BELL	$10.6 e^+ e^-$

1 Supersedes AUBERT 03G.
 2 Systematic errors not evaluated.
 3 Not independent of the corresponding $m_{D_{s0}^*(2317)} - m_{D_s}$.
 4 From $D_s^+ \rightarrow K^+ K^- \pi^+$ decay.
 5 From $D_s^+ \rightarrow K^+ K^- \pi^+ \pi^0$ decay.

 $m_{D_{s0}^*(2317)^\pm} = m_{D_s^\pm}$

The fit includes $D^\pm, D^0, D_s^\pm, D^{*\pm}, D^{*0}, D_s^{*\pm}, D_1(2420)^0, D_2^{*}(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
349.3±0.6 OUR FIT				Error includes scale factor of 1.1.
349.2±0.7 OUR AVERAGE				
348.7±0.5±0.7	761	MIKAMI	04 BELL	$10.6 e^+ e^-$
350.0±1.2±1.0	135	BESSON	03 CLE2	$10.6 e^+ e^-$
351.3±2.1±1.9	24	⁶ KROKOVNY	03B BELL	$10.6 e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
349.6±0.4±3.0	1267	^{7,8} AUBERT	03G BABR	$10.6 e^+ e^-$
350.2±1.3	273	^{9,10} AUBERT	03G BABR	$10.6 e^+ e^-$

6 Recalculated by us using $m_{D_s^+} = 1968.5 \pm 0.6$ MeV.
 7 From $D_s^+ \rightarrow K^+ K^- \pi^+$ decay.
 8 Recalculated by us using $m_{D_s^+} = 1967.20 \pm 0.03$ MeV.
 9 From $D_s^+ \rightarrow K^+ K^- \pi^+ \pi^0$ decay.
 10 Recalculated by us using $m_{D_s^+} = 1967.4 \pm 0.2$ MeV. Systematic errors not estimated.

 $D_{s0}^*(2317)^\pm$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
< 3.8	95	3180	AUBERT	06P BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^0 X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 4.6	90	761	MIKAMI	04 BELL	$10.6 e^+ e^-$
< 10			AUBERT	03G BABR	$10.6 e^+ e^-$
< 7	90	135	BESSON	03 CLE2	$10.6 e^+ e^-$

NODE=M172

NODE=M172

NODE=M172M

NODE=M172M

NODE=M172M

OCCUR=2

NODE=M172M;LINKAGE=AU

NODE=M172M;LINKAGE=AB

NODE=M172M;LINKAGE=B1

NODE=M172M;LINKAGE=A1

NODE=M172M;LINKAGE=A2

NODE=M172DM

NODE=M172DM

NODE=M172DM

OCCUR=2

NODE=M172DM;LINKAGE=K3

NODE=M172DM;LINKAGE=A1

NODE=M172DM;LINKAGE=C1

NODE=M172DM;LINKAGE=A2

NODE=M172DM;LINKAGE=C2

NODE=M172W

NODE=M172W

$D_{s0}^*(2317)^\pm$ DECAY MODES $D_{s0}^*(2317)^\pm$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D_s^+ \pi^0$	seen
$\Gamma_2 D_s^+ \gamma$	
$\Gamma_3 D_s^*(2112)^+ \gamma$	
$\Gamma_4 D_s^+ \gamma\gamma$	
$\Gamma_5 D_s^*(2112)^+ \pi^0$	
$\Gamma_6 D_s^+ \pi^+ \pi^-$	
$\Gamma_7 D_s^+ \pi^0 \pi^0$	not seen

 $D_{s0}^*(2317)^\pm$ BRANCHING RATIOS

$\Gamma(D_s^+ \pi^0)/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
seen	1540 \pm 62 AUBERT 03G BABR 10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \gamma)/\Gamma(D_s^+ \pi^0)$	Γ_2/Γ_1
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.05	90 MIKAMI 04 BELL 10.6 e ⁺ e ⁻
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.14	95 AUBERT 06P BABR 10.6 e ⁺ e ⁻
<0.052	90 BESSON 03 CLE2 10.6 e ⁺ e ⁻
$\Gamma(D_s^*(2112)^+ \gamma)/\Gamma(D_s^+ \pi^0)$	Γ_3/Γ_1
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.059	90 BESSON 03 CLE2 10.6 e ⁺ e ⁻
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.16	95 AUBERT 06P BABR 10.6 e ⁺ e ⁻
<0.18	90 MIKAMI 04 BELL 10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \gamma\gamma)/\Gamma(D_s^+ \pi^0)$	Γ_4/Γ_1
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.18	95 AUBERT 06P BABR 10.6 e ⁺ e ⁻
• • • We do not use the following data for averages, fits, limits, etc. • • •	
not seen	AUBERT 03G BABR 10.6 e ⁺ e ⁻
$\Gamma(D_s^*(2112)^+ \pi^0)/\Gamma(D_s^+ \pi^0)$	Γ_5/Γ_1
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.11	90 BESSON 03 CLE2 10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \pi^+ \pi^-)/\Gamma(D_s^+ \pi^0)$	Γ_6/Γ_1
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.004	90 MIKAMI 04 BELL 10.6 e ⁺ e ⁻
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.005	95 AUBERT 06P BABR 10.6 e ⁺ e ⁻
<0.019	90 BESSON 03 CLE2 10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \pi^0 \pi^0)/\Gamma(D_s^+ \pi^0)$	Γ_7/Γ_1
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<0.25	95 AUBERT 06P BABR 10.6 e ⁺ e ⁻

 $D_{s0}^*(2317)^\pm$ REFERENCES

AUBERT	06P	PR D74 032007	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	04E	PR D69 031101	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,B	04S	PRL 93 181801	B. Aubert <i>et al.</i>	(BABAR Collab.)
MIKAMI	04	PRL 92 012002	Y. Mikami <i>et al.</i>	(BELLE Collab.)
AUBERT	03G	PRL 90 242001	B. Aubert <i>et al.</i>	(BaBar Collab.)
BESSON	03	PR D68 032002	D. Besson <i>et al.</i>	(CLEO Collab.)
KROKOVNY	03B	PRL 91 262002	P. Krokovny <i>et al.</i>	(BELLE Collab.)

NODE=M172215;NODE=M172

NODE=M172

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

DESIG=6

DESIG=7;OUR EVAL; \rightarrow UNCHECKED \leftarrow

NODE=M172220

NODE=M172R1

NODE=M172R1

NODE=M172R5

NODE=M172R5

NODE=M172R6

NODE=M172R6

NODE=M172R7

NODE=M172R7

NODE=M172R8

NODE=M172R8

NODE=M172R9

NODE=M172R9

NODE=M172R10

NODE=M172R10

NODE=M172

REFID=51144

REFID=49747

REFID=50195

REFID=49629

REFID=49417

REFID=49583

REFID=49615

NODE=M173

 $D_{s1}(2460)^{\pm}$ $I(J^P) = 0(1^+)$ **$D_{s1}(2460)^{\pm}$ MASS**

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*(2460)}^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

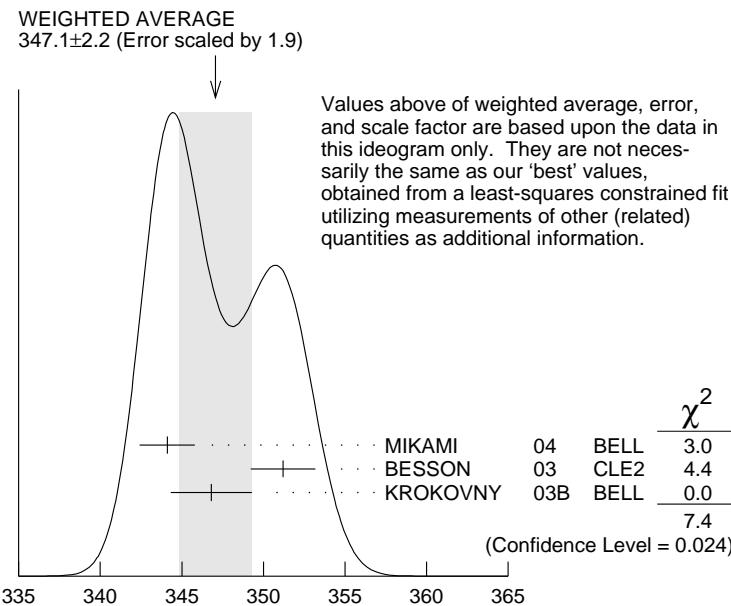
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2459.6±0.6 OUR FIT		Error includes scale factor of 1.1.			NODE=M173M
2459.6±0.9 OUR AVERAGE		Error includes scale factor of 1.3.			NODE=M173M
2460.1±0.2±0.8	1	AUBERT	06P BABR	10.6 $e^+ e^-$	
2458.0±1.0±1.0	195	AUBERT	04E BABR	10.6 $e^+ e^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2459.5±1.2±3.7	920	AUBERT	06P BABR	10.6 $e^+ e^- \rightarrow D_s^+ \gamma X$	OCCUR=2
2458.6±1.0±2.5	560	AUBERT	06P BABR	10.6 $e^+ e^- \rightarrow D_s^+ \pi^0 \gamma X$	OCCUR=3
2460.2±0.2±0.8	123	AUBERT	06P BABR	10.6 $e^+ e^- \rightarrow D_s^+ \pi^+ \pi^- X$	OCCUR=4
2458.9±1.5	112	2 AUBERT,B	04S BABR	$B \rightarrow D_{s1}(2460)^+ \bar{D}^(*)$	
2461.1±1.6	139	3 AUBERT,B	04S BABR	$B \rightarrow D_{s1}(2460)^+ \bar{D}^(*)$	
2456.5±1.3±1.3	126	4,5 MIKAMI	04 BELL	10.6 $e^+ e^-$	OCCUR=2
2459.5±1.3±2.0	152	6,7 MIKAMI	04 BELL	10.6 $e^+ e^-$	OCCUR=2
2459.9±0.9±1.6	60	6,7 MIKAMI	04 BELL	10.6 $e^+ e^-$	OCCUR=3
2459.2±1.6±2.0	57	KROKOVNY	03B BELL	10.6 $e^+ e^-$	OCCUR=3
1 The average of the values obtained from the $D_s^+ \gamma$, $D_s^+ \pi^0 \gamma$, $D_s^+ \pi^+ \pi^-$ final state.					
2 Systematic errors not evaluated. From the decay to $D_s^{*+} \pi^0$.					
3 Systematic errors not evaluated. From the decay to $D_s^+ \gamma$.					
4 Not independent of the corresponding $m_{D_{s1}(2460)^{\pm}} - m_{D_s^{*\pm}}$.					
5 Using $m_{D_s^{*+}} = 2112.4 \pm 0.7$ MeV.					
6 Not independent of the corresponding $m_{D_{s1}(2460)^{\pm}} - m_{D_s^{\pm}}$.					
7 Using $m_{D_s^+} = 1968.5 \pm 0.6$ MeV.					

$$m_{D_{s1}(2460)^{\pm}} = m_{D_s^{*\pm}}$$

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*(2460)}^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
347.2±0.7 OUR FIT		Error includes scale factor of 1.2.			NODE=M173MD
347.1±2.2 OUR AVERAGE		Error includes scale factor of 1.9. See the ideogram below.			NODE=M173MD
344.1±1.3±1.1	126	MIKAMI	04 BELL	10.6 $e^+ e^-$	
351.2±1.7±1.0	41	BESSON	03 CLE2	10.6 $e^+ e^-$	
346.8±1.6±1.9	57	8 KROKOVNY	03B BELL	10.6 $e^+ e^-$	
8 Recalculated by us using $m_{D_s^{*+}} = 2112.4 \pm 0.7$ MeV.					

NODE=M173MD;LINKAGE=K3



$$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{*\pm}}$$

$$m_{D_{s1}(2460)^{\pm}} = m_{D_s^{\pm}}$$

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
491.1±0.7 OUR FIT	Error includes scale factor of 1.1.			NODE=M173DM
491.3±1.4 OUR AVERAGE				NODE=M173DM
491.0±1.3±1.9	152	⁹ MIKAMI	04	BELL 10.6 $e^+ e^-$
491.4±0.9±1.5	60	¹⁰ MIKAMI	04	BELL 10.6 $e^+ e^-$
⁹ From the decay to $D_s^{\pm} \gamma$.				
¹⁰ From the decay to $D_s^{\pm} \pi^+ \pi^-$.				

$D_{s1}(2460)^{\pm}$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
< 3.5	95	123	AUBERT	06P BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^+ \pi^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 6.3	95	560	AUBERT	06P BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^0 \gamma X$
< 10		195	AUBERT	04E BABR	$10.6 e^+ e^-$
< 5.5	90	126	MIKAMI	04 BELL	$10.6 e^+ e^-$
< 7	90	41	BESSON	03 CLE2	$10.6 e^+ e^-$

$D_{s1}(2460)^+$ DECAY MODES

$D_{s1}(2460)^-$ modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
$\Gamma_1 D_s^{*+} \pi^0$	(48 ± 11) %	
$\Gamma_2 D_s^+ \gamma$	(18 ± 4) %	
$\Gamma_3 D_s^+ \pi^+ \pi^-$	(4.3 ± 1.3) %	S=1.1
$\Gamma_4 D_s^{*+} \gamma$	< 8 %	CL=90%
$\Gamma_5 D_{s0}^*(2317)^+ \gamma$	(3.7 ± 5.0) %	
$\Gamma_6 D_s^+ \pi^0$		
$\Gamma_7 D_s^+ \pi^0 \pi^0$		
$\Gamma_8 D_s^+ \gamma \gamma$		

NODE=M173215; NODE=M173
NODE=M173
NODE=M173DM
NODE=M173DM
NODE=M173DM
OCCUR=2
NODE=M173DM;LINKAGE=M1
NODE=M173DM;LINKAGE=M2
NODE=M173W
NODE=M173W
OCCUR=2
NODE=M173215; NODE=M173
NODE=M173
DESIG=1
DESIG=2
DESIG=3
DESIG=4
DESIG=5
DESIG=7
DESIG=8
DESIG=9

CONSTRAINED FIT INFORMATION

An overall fit to 7 branching ratios uses 8 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 3.4$ for 4 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	80			
x_3	68	62		
x_5	-3	25	26	
	x_1	x_2	x_3	

$D_{s1}(2460)^{\pm}$ BRANCHING RATIOS

$\Gamma(D_s^{*+} \pi^0) / \Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1 / Γ
-------	------	-------------	------	---------	---------------------

0.48 ± 0.11 OUR FIT

0.56 ± 0.13 ± 0.09 11 AUBERT 06N BABR $B \rightarrow D_{s1}(2460)^- \bar{D}^(*)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

seen 41 BESSON 03 CLE2 10.6 e⁺ e⁻

11 Evaluated in AUBERT 06N including measurements from AUBERT,B 04S.

$\Gamma(D_s^+ \gamma) / \Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2 / Γ
-------	-------------	------	---------	---------------------

0.18 ± 0.04 OUR FIT

0.16 ± 0.04 ± 0.03 12 AUBERT 06N BABR $B \rightarrow D_{s1}(2460)^- \bar{D}^(*)$

12 Evaluated in AUBERT 06N including measurements from AUBERT,B 04S.

$\Gamma(D_s^+ \gamma) / \Gamma(D_s^{*+} \pi^0)$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2 / Γ_1
-------	-----	------	-------------	------	---------	-----------------------

0.38 ± 0.05 OUR FIT

0.44 ± 0.09 OUR AVERAGE

0.55 ± 0.13 ± 0.08 152 MIKAMI 04 BELL 10.6 e⁺ e⁻

0.38 ± 0.11 ± 0.04 38 KROKOVNY 03B BELL 10.6 e⁺ e⁻

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.274 ± 0.045 ± 0.020 251 13 AUBERT,B 04S BABR $B \rightarrow D_{s1}(2460)^+ \bar{D}^(*)$

< 0.49 90 BESSON 03 CLE2 10.6 e⁺ e⁻

13 Used by AUBERT 06N in their measurement of $B(D_s^{*-} \pi^0)$ and $B(D_s^- \gamma)$.

$\Gamma(D_s^+ \pi^+ \pi^-) / \Gamma(D_s^{*+} \pi^0)$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3 / Γ_1
-------	-----	------	-------------	------	---------	-----------------------

0.090 ± 0.020 OUR FIT Error includes scale factor of 1.2.

0.14 ± 0.04 ± 0.02 60 MIKAMI 04 BELL 10.6 e⁺ e⁻

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 0.08 90 BESSON 03 CLE2 10.6 e⁺ e⁻

$\Gamma(D_s^{*+} \gamma) / \Gamma(D_s^{*+} \pi^0)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_4 / Γ_1
-------	-----	-------------	------	---------	-----------------------

<0.16 90 BESSON 03 CLE2 10.6 e⁺ e⁻

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 0.31 90 MIKAMI 04 BELL 10.6 e⁺ e⁻

$\Gamma(D_{s0}^*(2317)^+ \gamma) / \Gamma(D_s^{*+} \pi^0)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_5 / Γ_1
-------	-----	-------------	------	---------	-----------------------

<0.22 95 AUBERT 04E BABR 10.6 e⁺ e⁻

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 0.58 90 BESSON 03 CLE2 10.6 e⁺ e⁻

NODE=M173220

NODE=M173R1
NODE=M173R1

NODE=M173R1;LINKAGE=AU

NODE=M173R6
NODE=M173R6

NODE=M173R6;LINKAGE=AU

NODE=M173R2
NODE=M173R2

NODE=M173R2;LINKAGE=AU

NODE=M173R3
NODE=M173R3

NODE=M173R4
NODE=M173R4

NODE=M173R5
NODE=M173R5

$\Gamma(D_s^{*+}\pi^0)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_1/(\Gamma_1+\Gamma_5)$	NODE=M173R7 NODE=M173R7	
0.93±0.09 OUR FIT						
0.97±0.09±0.05	AUBERT	06P	BABR	10.6 $e^+ e^-$		
$\Gamma(D_s^+\gamma)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_2/(\Gamma_1+\Gamma_5)$	NODE=M173R8 NODE=M173R8	
0.35 ± 0.04 OUR FIT						
0.337±0.036±0.038	AUBERT	06P	BABR	10.6 $e^+ e^-$		
$\Gamma(D_s^+\pi^+\pi^-)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_3/(\Gamma_1+\Gamma_5)$	NODE=M173R9 NODE=M173R9	
0.083±0.017 OUR FIT	Error includes scale factor of 1.2.					
0.077±0.013±0.008	AUBERT	06P	BABR	10.6 $e^+ e^-$		
$\Gamma(D_s^{*+}\gamma)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_4/(\Gamma_1+\Gamma_5)$	
<0.24	95	AUBERT	06P	BABR	10.6 $e^+ e^-$	NODE=M173R10 NODE=M173R10
$\Gamma(D_{s0}^*(2317)^+\gamma)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_5/(\Gamma_1+\Gamma_5)$	
<0.25	95	AUBERT	06P	BABR	10.6 $e^+ e^-$	NODE=M173R11 NODE=M173R11
$\Gamma(D_s^+\pi^0)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_6/(\Gamma_1+\Gamma_5)$	
<0.042	95	AUBERT	06P	BABR	10.6 $e^+ e^-$	NODE=M173R12 NODE=M173R12
$\Gamma(D_s^+\pi^0\pi^0)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_7/(\Gamma_1+\Gamma_5)$	
<0.68	95	AUBERT	06P	BABR	10.6 $e^+ e^-$	NODE=M173R13 NODE=M173R13
$\Gamma(D_s^+\gamma\gamma)/[\Gamma(D_s^{*+}\pi^0) + \Gamma(D_{s0}^*(2317)^+\gamma)]$	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_8/(\Gamma_1+\Gamma_5)$	
<0.33	95	AUBERT	06P	BABR	10.6 $e^+ e^-$	NODE=M173R14 NODE=M173R14

 $D_{s1}(2460)^\pm$ REFERENCES

AUBERT	06N	PR D74 031103	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51142
AUBERT	06P	PR D74 032007	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51144
AUBERT	04E	PR D69 031101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=49747
AUBERT,B	04S	PRL 93 181801	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50195
MIKAMI	04	PRL 92 012002	Y. Mikami <i>et al.</i>	(BELLE Collab.)	REFID=49629
BESSON	03	PR D68 032002	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=49583
KROKOVNY	03B	PRL 91 262002	P. Krokovny <i>et al.</i>	(BELLE Collab.)	REFID=49615

NODE=M121

 $D_{s1}(2536)^{\pm}$
 $I(J^P) = 0(1^+)$
 J, P need confirmation.

Seen in $D^*(2010)^+ K^0$, $D^*(2007)^0 K^+$, and $D_s^+ \pi^+ \pi^-$. Not seen in $D^+ K^0$ or $D^0 K^+$. $J^P = 1^+$ assignment strongly favored.

 $D_{s1}(2536)^{\pm}$ MASS

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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2535.12±0.13 OUR FIT**2535.18±0.24 OUR AVERAGE**

2535.7 ± 0.6	± 0.5	46 \pm 9	1 ABAZOV	09G D0	$B_s^0 \rightarrow D_{s1}^- \mu^+ \nu_\mu X$
2534.78 ± 0.31	± 0.40	182	AUBERT	08B BABR	$B \rightarrow \bar{D}^{(*)} D^* K$
2534.6 ± 0.3	± 0.7	193	AUBERT	06P BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^+ \pi^- X$
2535.3 ± 0.7		92	2 HEISTER	02B ALEP	$e^+ e^- \rightarrow D^{*+} K^0 X, D^{*0} K^+ X$
2534.2 ± 1.2		9	ASRATYAN	94 BEBC	$\nu N \rightarrow D^* K^0 X, D^{*0} K^\pm X$
2535 ± 0.6	± 1	75	FRABETTI	94B E687	$\gamma Be \rightarrow D^{*+} K^0 X, D^{*0} K^+ X$
2535.3 ± 0.2	± 0.5	134	ALEXANDER	93 CLE2	$e^+ e^- \rightarrow D^{*0} K^+ X$
2534.8 ± 0.6	± 0.6	44	ALEXANDER	93 CLE2	$e^+ e^- \rightarrow D^{*+} K^0 X$
2535.2 ± 0.5	± 1.5	28	ALBRECHT	92R ARG	$10.4 e^+ e^- \rightarrow D^{*0} K^+ X$
2536.6 ± 0.7	± 0.4		AVERY	90 CLEO	$e^+ e^- \rightarrow D^{*+} K^0 X$
2535.9 ± 0.6	± 2.0		ALBRECHT	89E ARG	$D_{s1}^* \rightarrow D^*(2010) K^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2534.1 ± 0.6		116	3 AUSHEV	11 BELL	$B \rightarrow D_{s1}(2536)^+ D^{(*)}$
2535.08 ± 0.01	± 0.15	8038	4 LEES	11B BABR	$10.6 e^+ e^- \rightarrow D^{*+} K_S^0 X$
$2535.57^{+0.44}_{-0.41}$	± 0.10	236 \pm 30	5 CHEKANOV	09 ZEUS	$e^\pm p \rightarrow D^{*+} K_S^0 X, D^{*0} K^+ X$
2535 ± 28			6 ASRATYAN	88 HLBC	$\nu N \rightarrow D_s \gamma \gamma X$

1 Using the $D^*(2010)^{\pm}$ mass of 2010.0 ± 0.4 MeV from PDG 06.

2 Calculated using $m(D^*(2010)^{\pm}) = 2010.0 \pm 0.5$ MeV, $m(D^*(2007)^0) = 2006.7 \pm 0.5$ MeV, and the mass difference below.

3 Systematic uncertainties not evaluated.

4 Calculated using the mass difference $m(D_{s1}^+) - m(D^{*+})_{PDG}$ below and $m(D^{*+})_{PDG} = 2010.25 \pm 0.14$ MeV. Assuming S-wave decay of the $D_{s1}(2536)$ to $D^{*+} K_S^0$, using a Breit-Wigner line shape corresponding to $L=0$.

5 Calculated using the mass difference $m(D_{s1}^+) - m(D^{*+})_{PDG}$ reported below and $m(D^{*+})_{PDG} = 2010.27 \pm 0.17$ MeV.

6 Not seen in $D^* K$.

NODE=M121M

NODE=M121M

NODE=M121M

OCCUR=2

NODE=M121M;LINKAGE=AB

NODE=M121M;LINKAGE=HI

NODE=M121M;LINKAGE=AU

NODE=M121M;LINKAGE=LE

NODE=M121M;LINKAGE=CH

NODE=M121M;LINKAGE=BL

NODE=M121DM

NODE=M121DM

NODE=M121DM

NODE=M121DN

NODE=M121DN

 $m_{D_{s1}(2536)^{\pm}} - m_{D_s^*(2111)^{\pm}}$

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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422.8±0.5 OUR FIT Error includes scale factor of 1.1.

424 ± 28	ASRATYAN	88 HLBC	$D_s^{*\pm} \gamma$
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 $m_{D_{s1}(2536)^{\pm}} - m_{D^*(2010)^{\pm}}$

The fit includes D^{\pm} , D^0 , D_s^{\pm} , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT		NODE=M121DN
524.84±0.04 OUR FIT						
524.84±0.04 OUR AVERAGE						
524.83±0.01±0.04	8038	7 LEES	11B BABR	$10.6 e^+ e^- \rightarrow D^{*+} K_S^0 X$		
$525.30^{+0.44}_{-0.41} \pm 0.10$	236 ± 30	CHEKANOV 09	ZEUS	$e^\pm p \rightarrow D^{*+} K_S^0 X,$		
$525.3 \pm 0.6 \pm 0.1$	41	HEISTER	02B ALEP	$e^+ e^- \rightarrow D^{*0} K^+ X$		
<i>7 Assuming S-wave decay of the $D_{s1}(2536)$ to $D^{*+} K_S^0$, using a Breit-Wigner line shape corresponding to L=0.</i>						NODE=M121DN;LINKAGE=LE
$m_{D_{s1}(2536)^\pm} - m_{D^*(2007)^0}$						
The fit includes $D^\pm, D^0, D_s^\pm, D^{*\pm}, D^{*0}, D_s^{*\pm}, D_1(2420)^0, D_2^{*0}(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.						
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT		NODE=M121DP
528.14±0.08 OUR FIT						
528.1 ±1.5 OUR AVERAGE						
528.7 $\pm 1.9 \pm 0.5$	51	HEISTER	02B ALEP	$e^+ e^- \rightarrow D^{*0} K^+ X$		
527.3 ± 2.2	29	ACKERSTAFF	97W OPAL	$e^+ e^- \rightarrow D^{*0} K^+ X$		
$D_{s1}(2536)^\pm$ WIDTH						
VALUE (MeV)	CL% EVTS	DOCUMENT ID	TECN	COMMENT		NODE=M121W
0.92±0.03±0.04	8038	8 LEES	11B BABR	$10.6 e^+ e^- \rightarrow D^{*+} K_S^0 X$		NODE=M121W
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.75±0.23	116	9 AUSHEV	11 BELL	$B \rightarrow D_{s1}(2536)^+ D^{(*)}$		
< 2.5	95	193 AUBERT	06P BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^+ \pi^- X$		
< 3.2	90	75 FRABETTI	94B E687	$\gamma Be \rightarrow D^{*+} K^0 X,$		
< 2.3	90	ALEXANDER	93 CLEO	$e^+ e^- \rightarrow D^{*0} K^+ X$		
< 3.9	90	ALBRECHT	92R ARG	$10.4 e^+ e^- \rightarrow D^{*0} K^+ X$		
< 5.44	90	AVERY	90 CLEO	$e^+ e^- \rightarrow D^{*+} K^0 X$		
< 4.6	90	ALBRECHT	89E ARG	$D_{s1}^* \rightarrow D^*(2010) K^0$		
<i>8 Assuming S-wave decay of the $D_{s1}(2536)$ to $D^{*+} K_S^0$, using a Breit-Wigner line shape corresponding to L=0.</i>						
9 Systematic uncertainties not evaluated.						
$D_{s1}(2536)^+$ DECAY MODES						
$D_{s1}(2536)^-$ modes are charge conjugates of the modes below.						
Mode				Fraction (Γ_i/Γ)		
Γ_1	$D^*(2010)^+ K^0$			seen		DESIG=1;OUR EST;→ UNCHECKED ←
Γ_2	$(D^*(2010)^+ K^0)_{S-wave}$					DESIG=7
Γ_3	$(D^*(2010)^+ K^0)_{D-wave}$					DESIG=9
Γ_4	$D^+ \pi^- K^+$					DESIG=8
Γ_5	$D^*(2007)^0 K^+$			seen		DESIG=4;OUR EST;→ UNCHECKED ←
Γ_6	$D^+ K^0$			not seen		DESIG=2;OUR EST;→ UNCHECKED ←
Γ_7	$D^0 K^+$			not seen		DESIG=5;OUR EST;→ UNCHECKED ←
Γ_8	$D_s^{*+} \gamma$			possibly seen		DESIG=3
Γ_9	$D_s^+ \pi^+ \pi^-$			seen		DESIG=6

$D_{s1}(2536)^+$ BRANCHING RATIOS

$\Gamma(D^*(2007)^0 K^+)/\Gamma(D^*(2010)^+ K^0)$					Γ_5/Γ_1
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
1.18±0.16 OUR AVERAGE					
0.88±0.24±0.08	116	AUSHEV	11	BELL $B \rightarrow D_{s1}(2536)^+ D^(*)$	
2.3 ± 0.6 ± 0.3	236 ± 30	CHEKANOV	09	ZEUS $e^\pm p \rightarrow D^{*+} K_S^0 X$	
1.32±0.47±0.23	92	HEISTER	02B	ALEP $e^+ e^- \rightarrow D^{*0} K^+ X$	
1.9 $^{+1.1}_{-0.9}$ ± 0.4	35	ACKERSTAFF	97W	OPAL $D^{*0} K^+ X$	
1.1 ± 0.3		ALEXANDER	93	CLEO $e^+ e^- \rightarrow D^{*+} K^0 X$	
1.4 ± 0.3 ± 0.2		ALBRECHT	92R	ARG $D^{*0} K^+ X, D^{*+} K^0 X$	
10.4 $e^+ e^- \rightarrow D^{*0} K^+ X, D^{*+} K^0 X$					

10 Ratio of the production rates measured in Z^0 decays.

11 Evaluated by us from published inclusive cross-sections.

$\Gamma((D^*(2010)^+ K^0)_{S-wave})/\Gamma(D^*(2010)^+ K^0)$					Γ_2/Γ_1
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.72±0.05±0.01	5485	BALAGURA	08	BELL $10.6 e^+ e^- \rightarrow D^{*+} K^0 X$	

$\Gamma(D^+ \pi^- K^+)/\Gamma(D^*(2010)^+ K^0)$					Γ_4/Γ_1
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.27±0.18±0.37	1264	BALAGURA	08	BELL $10.6 e^+ e^- \rightarrow D^+ \pi^- K^+ X$	

$\Gamma(D^+ K^0)/\Gamma(D^*(2010)^+ K^0)$					Γ_6/Γ_1
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.40	90	ALEXANDER	93	CLEO $e^+ e^- \rightarrow D^{*+} K^0 X$	
<0.43	90	ALBRECHT	89E	ARG $D_{s1}^* \rightarrow D^*(2010)^+ K^0$	

$\Gamma(D^0 K^+)/\Gamma(D^*(2007)^0 K^+)$					Γ_7/Γ_5
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.12	90	ALEXANDER	93	CLEO $e^+ e^- \rightarrow D^{*0} K^+ X$	

$\Gamma(D_s^{*+} \gamma)/\Gamma_{total}$					Γ_8/Γ
VALUE	DOCUMENT ID	TECN	COMMENT		
possibly seen	ASRATYAN	88	HLBC	$\nu N \rightarrow D_s \gamma \gamma X$	

$\Gamma(D_s^{*+} \gamma)/\Gamma(D^*(2007)^0 K^+)$					Γ_8/Γ_5
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.42	90	ALEXANDER	93	CLEO $e^+ e^- \rightarrow D^{*0} K^+ X$	

$\Gamma(D_s^+ \pi^+ \pi^-)/\Gamma_{total}$					Γ_9/Γ
VALUE	DOCUMENT ID	TECN	COMMENT		
seen	AUBERT	06P	BABR	$10.6 e^+ e^- \rightarrow D_s^+ \pi^+ \pi^- X$	

 $D_{s1}(2536)^{\pm}$ REFERENCES

AUSHEV	11	PR D83 051102	T. Aushev <i>et al.</i>	(BELLE Collab.)
LEES	11B	PR D83 072003	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ABAZOV	09G	PRL 102 051801	V.M. Abazov <i>et al.</i>	(D0 Collab.)
CHEKANOV	09	EPJ C60 25	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
AUBERT	08B	PR D77 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)
BALAGURA	08	PR D77 032001	V. Balagura <i>et al.</i>	(BELLE Collab.)
AUBERT	06P	PR D74 032007	B. Aubert <i>et al.</i>	(BABAR Collab.)
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
HEISTER	02B	PL B526 34	A. Heister <i>et al.</i>	(ALEPH Collab.)
ACKERSTAFF	97W	ZPHY C76 425	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
ASRATYAN	94	ZPHY C61 563	A.E. Asratyan <i>et al.</i>	(BIRM, BELG, CERN+) (FNAL E687 Collab.)
FRABETTI	94B	PRL 72 324	P.L. Frabetti <i>et al.</i>	(CLEO Collab.)
ALEXANDER	93	PL B303 377	J. Alexander <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	92R	PL B297 425	H. Albrecht <i>et al.</i>	(CLEO Collab.)
AVERY	90	PR D41 774	P. Avery, D. Besson	(ARGUS Collab.)
ALBRECHT	89E	PL B230 162	H. Albrecht <i>et al.</i>	(ITEP, SERP)
ASRATYAN	88	ZPHY C40 483	A.E. Asratyan <i>et al.</i>	

NODE=M121220

NODE=M121R6

NODE=M121R6

NODE=M121R6;LINKAGE=6A

NODE=M121R6;LINKAGE=A

NODE=M121R8

NODE=M121R8

NODE=M121R9

NODE=M121R9

NODE=M121R1

NODE=M121R1

NODE=M121R4

NODE=M121R4

NODE=M121R3

NODE=M121R3

NODE=M121R5

NODE=M121R5

NODE=M121R7

NODE=M121R7

NODE=M121

REFID=16505

REFID=16773

REFID=52652

REFID=52733

REFID=52120

REFID=52133

REFID=51144

REFID=51004

REFID=48562

REFID=45788

REFID=43667

REFID=43687

REFID=43316

REFID=43179

REFID=41013

REFID=40914

REFID=40916

NODE=M148

 $D_{s2}^*(2573)$ $I(J^P) = 0(?)$ J^P is natural, width and decay modes consistent with 2^+ . **$D_{s2}^*(2573)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2571.9 ± 0.8 OUR AVERAGE				
2569.4 $\pm 1.6 \pm 0.5$	82 ± 17	AAIJ	11A LHCb	$B_s \rightarrow D_{s2}^*(2573)\mu\nu X$
2572.2 $\pm 0.3 \pm 1.0$		AUBERT,BE	06E BABR	$e^+ e^- \rightarrow D K X$
2574.5 $\pm 3.3 \pm 1.6$		ALBRECHT	96 ARG	$e^+ e^- \rightarrow D^0 K^+ X$
2573.2 $^{+1.7}_{-1.6} \pm 0.9$	217	KUBOTA	94 CLE2	$e^+ e^- \sim 10.5$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2570.0 ± 4.3	25	¹ EVDOKIMOV	04 SELX	$600 \Sigma^- A \rightarrow D^0 K^+ X$
2568.6 ± 3.2	64	² HEISTER	02B ALEP	$e^+ e^- \rightarrow D^0 K^+ X$

1 Not independent of the mass difference below.

2 Calculated using $m_{D^0} = 1864.5 \pm 0.5$ MeV and the mass difference below. $m_{D_{s2}^*(2573)} - m_{D^0}$

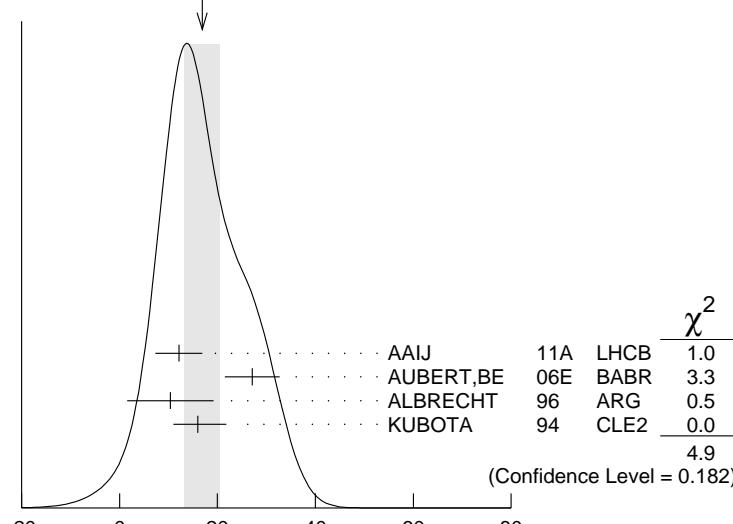
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
704 $\pm 3 \pm 1$				
HEISTER	64	02B ALEP		$e^+ e^- \rightarrow D^0 K^+ X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
705.4 ± 4.3	25	³ EVDOKIMOV	04 SELX	$600 \Sigma^- A \rightarrow D^0 K^+ X$

3 Systematic errors not estimated.

 $D_{s2}^*(2573)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
17 ± 4 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
12.1 $\pm 4.5 \pm 1.6$	82 ± 17	AAIJ	11A LHCb	$B_s \rightarrow D_{s2}^*(2573)\mu\nu X$
27.1 $\pm 0.6 \pm 5.6$		AUBERT,BE	06E BABR	$e^+ e^- \rightarrow D K X$
10.4 $\pm 8.3 \pm 3.0$		ALBRECHT	96 ARG	$e^+ e^- \rightarrow D^0 K^+ X$
16 $^{+5}_{-4} \pm 3$	217	KUBOTA	94 CLE2	$e^+ e^- \sim 10.5$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
14 $^{+9}_{-6}$	25	⁴ EVDOKIMOV	04 SELX	$600 \Sigma^- A \rightarrow D^0 K^+ X$

4 Systematic errors not estimated.

WEIGHTED AVERAGE
17 ± 4 (Error scaled by 1.3) $D_{s2}^*(2573)$ WIDTH (MeV)

NODE=M148

NODE=M148M

NODE=M148M

NODE=M148M;LINKAGE=EV

NODE=M148M;LINKAGE=HI

NODE=M148DM

NODE=M148DM

NODE=M148DM;LINKAGE=EV

NODE=M148W

NODE=M148W

NODE=M148W;LINKAGE=EV

$D_{s2}^*(2573)^+$ DECAY MODES

$D_{s2}^*(2573)^-$ modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D^0 K^+$	seen
$\Gamma_2 D^*(2007)^0 K^+$	not seen

$D_{s2}^*(2573)^+$ BRANCHING RATIOS

$\Gamma(D^0 K^+)/\Gamma_{\text{total}}$	Γ_1/Γ
VALUE	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>

$\Gamma(D^*(2007)^0 K^+)/\Gamma(D^0 K^+)$	Γ_2/Γ_1
VALUE	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>CHG</u> <u>COMMENT</u>

$D_{s2}^*(2573)$ REFERENCES

AAIJ	11A	PL B698 14	R. Aaij <i>et al.</i>	(LHCb Collab.)
AUBERT,BE	06E	PRL 97 222001	B. Aubert <i>et al.</i>	(BABAR Collab.)
EVDOKIMOV	04	PRL 93 242001	A.V. Evdokimov <i>et al.</i>	(SELEX Collab.)
HEISTER	02B	PL B526 34	A. Heister <i>et al.</i>	(ALEPH Collab.)
ALBRECHT	96	ZPHY C69 405	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
KUBOTA	94	PRL 72 1972	Y. Kubota <i>et al.</i>	(CLEO Collab.)

$D_{s1}^*(2700)^\pm$

$I(J^P) = 0(1^-)$

$D_{s1}^*(2700)^+$ MASS

VALUE (MeV)	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2709 ± 4 OUR AVERAGE				

[2709^{+9}_{-6} MeV OUR 2012 AVERAGE]

2709.2 $\pm 1.9 \pm 4.5$	52k	¹ AAIJ	12AU LHCb	$p p \rightarrow (D K)^+ X$ at 7 TeV
2710 ± 2	$^{+12}_{-7}$ 10.4k	² AUBERT	09AR BABR	$e^+ e^- \rightarrow D^{(*)} K X$

2708 ± 9	$^{+11}_{-10}$ 182	BRODZICKA	08 BELL	$B^+ \rightarrow D^0 \bar{D}^0 K^+$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

2688 ± 4 ± 3		³ AUBERT,BE	06E BABR	$10.6 e^+ e^- \rightarrow D K X$
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¹ From the combined fit of the $D^+ K_S^0$ and $D^0 K^+$ modes in the model including the $D_{s2}^*(2573)^+$, $D_{s1}^*(2700)^+$ and spin-0 $D_{s,J}^*(2860)^+$.

² From simultaneous fits to the two $D K$ mass spectra and to the total $D^* K$ mass spectrum.

³ Superseded by AUBERT 09AR.

$D_{s1}^*(2700)^+$ WIDTH

VALUE (MeV)	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
117 ± 13 OUR AVERAGE				

[125 ± 30 MeV OUR 2012 AVERAGE]

115.8 $\pm 7.3 \pm 12.1$	52k	⁴ AAIJ	12AU LHCb	$p p \rightarrow (D K)^+ X$ at 7 TeV
149 ± 7	$^{+39}_{-52}$ 10.4k	⁵ AUBERT	09AR BABR	$e^+ e^- \rightarrow D^{(*)} K X$

108 ± 23	$^{+36}_{-31}$ 182	BRODZICKA	08 BELL	$B^+ \rightarrow D^0 \bar{D}^0 K^+$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

112 ± 7 ± 36		⁶ AUBERT,BE	06E BABR	$10.6 e^+ e^- \rightarrow D K X$
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⁴ From the combined fit of the $D^+ K_S^0$ and $D^0 K^+$ modes in the model including the $D_{s2}^*(2573)^+$, $D_{s1}^*(2700)^+$ and spin-0 $D_{s,J}^*(2860)^+$.

⁵ From simultaneous fits to the two $D K$ mass spectra and to the total $D^* K$ mass spectrum.

⁶ Superseded by AUBERT 09AR.

NODE=M148215;NODE=M148

NODE=M148

DESIG=1

DESIG=2;OUR EVAL;→ UNCHECKED ←

NODE=M148220

NODE=M148R2

NODE=M148R2

NODE=M148R1

NODE=M148R1

NODE=M148

REFID=16665

REFID=51512

REFID=50337

REFID=48562

REFID=44631

REFID=43781

NODE=M182

NODE=M182M

NODE=M182M

NEW

NODE=M182M;LINKAGE=AA

NODE=M182M;LINKAGE=AB

NODE=M182M;LINKAGE=AU

NODE=M182W

NODE=M182W

NEW

NODE=M182W;LINKAGE=AA

NODE=M182W;LINKAGE=AB

NODE=M182W;LINKAGE=AU

$D_{s1}^*(2700)^\pm$ DECAY MODES

NODE=M182215;NODE=M182

Mode	
Γ_1	DK
Γ_2	$D^0 K^+$
Γ_3	$D^+ K_S^0$
Γ_4	$D^* K$
Γ_5	$D^{*0} K^+$
Γ_6	$D^{*+} K_S^0$

 $D_{s1}^*(2700)^\pm$ BRANCHING RATIOS **$\Gamma(D^* K)/\Gamma(DK)$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ_1
$0.91 \pm 0.13 \pm 0.12$	10.4k	7 AUBERT	09AR BABR	$e^+ e^- \rightarrow D^{(*)} K X$	

7 From the average of the corresponding ratios with $D^{(*)0} K^+$ and $D^{(*)+} K_S^0$. **$\Gamma(D^{*0} K^+)/\Gamma(D^0 K^+)$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ_2
• • • We do not use the following data for averages, fits, limits, etc. • • •					

0.88 $\pm 0.14 \pm 0.14$ 7716 8 AUBERT 09AR BABR $e^+ e^- \rightarrow D^{(*)} K X$ 8 From the $D^{*0} K^+$ and $D^0 K^+$, where $D^{*0} \rightarrow D^0 \pi^0$. **$\Gamma(D^{*+} K_S^0)/\Gamma(D^+ K_S^0)$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_3
• • • We do not use the following data for averages, fits, limits, etc. • • •					

1.14 $\pm 0.39 \pm 0.23$ 2700 9 AUBERT 09AR BABR $e^+ e^- \rightarrow D^{(*)} K X$ 9 From the $D^{*+} K_S^0$ and $D^+ K_S^0$, where $D^{*+} \rightarrow D^+ \pi^0$. **$D_{s1}^*(2700)^\pm$ REFERENCES**

AAIJ	12AU	JHEP 1210 151	R. Aaij <i>et al.</i>	(LHCb Collab.)
AUBERT	09AR	PR D80 092003	B. Aubert <i>et al.</i>	(BABAR Collab.)
BRODZICKA	08	PRL 100 092001	J. Brodzicka <i>et al.</i>	(BELLE Collab.)
AUBERT,BE	06E	PRL 97 222001	B. Aubert <i>et al.</i>	(BABAR Collab.)

 $D_{sJ}^*(2860)^\pm$

$I(J^P) = 0(?)$

OMITTED FROM SUMMARY TABLE

Observed by AUBERT,BE 06E and AUBERT 09AR in inclusive production of DK and $D^* K$ in $e^+ e^-$ annihilation. J^P is natural. **$D_{sJ}^*(2860)^\pm$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	------	-------------	------	---------

2863.2 ± 4.0 OUR AVERAGE[2862 ± 5.4 MeV OUR 2012 AVERAGE]2866.1 $\pm 1.0 \pm 6.3$ 36k 1 AAIJ 12AU LHCb $p p \rightarrow (DK)^+ X$ at 7 TeV |
2862 ± 2 ± 5 3122 2 AUBERT 09AR BABR $e^+ e^- \rightarrow D^{(*)} K X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2856.6 $\pm 1.5 \pm 5.0$ 3 AUBERT,BE 06E BABR $e^+ e^- \rightarrow DK X$

DESIG=2

DESIG=1

DESIG=3

DESIG=4

DESIG=5

DESIG=6

NODE=M182225

NODE=M182R01

NODE=M182R01

NODE=M182R01;LINKAGE=AU

NODE=M182R02

NODE=M182R02

NODE=M182R02;LINKAGE=AU

NODE=M182R03

NODE=M182R03

NODE=M182R03;LINKAGE=AU

NODE=M182

REFID=54735

REFID=53135

REFID=52144

REFID=51512

NODE=M196

NODE=M196

NODE=M196M

NODE=M196M

NEW

¹ From the combined fit of the $D^+ K_S^0$ and $D^0 K^+$ modes in the model including the $D_{s2}^*(2573)^+$, $D_{s1}^*(2700)^+$ and spin-0 $D_{sJ}^*(2860)^+$.

² From simultaneous fits to the two DK mass spectra and to the total $D^* K$ mass spectrum.

³ Superseded by AUBERT 09AR.

NODE=M196M;LINKAGE=AA

NODE=M196M;LINKAGE=AB

NODE=M196M;LINKAGE=AU

NODE=M196W

NODE=M196W

NEW

NODE=M196W;LINKAGE=AA

NODE=M196W;LINKAGE=AB

NODE=M196W;LINKAGE=AU

NODE=M196215;NODE=M196

Mode

Γ_1	DK
Γ_2	$D^0 K^+$
Γ_3	$D^+ K_S^0$
Γ_4	$D^* K$
Γ_5	$D^{*0} K^+$
Γ_6	$D^{*+} K_S^0$

$D_{sJ}^*(2860)^\pm$ DECAY MODES

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

DESIG=6

NODE=M196225

NODE=M196R01
NODE=M196R01

NODE=M196R01;LINKAGE=AU

NODE=M196R02
NODE=M196R02

NODE=M196R02;LINKAGE=AU

NODE=M196R03
NODE=M196R03

NODE=M196R03;LINKAGE=AU

NODE=M196

REFID=54735
REFID=53135
REFID=51512

$D_{sJ}^*(2860)^\pm$ BRANCHING RATIOS

$\Gamma(D^* K)/\Gamma(DK)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ_1
$1.10 \pm 0.15 \pm 0.19$	3122	7 AUBERT	09AR BABR	$e^+ e^- \rightarrow D^{(*)} K X$	

⁷ From the average of the corresponding ratios with $D^{(*)0} K^+$ and $D^{(*)+} K_S^0$.

$\Gamma(D^{*0} K^+)/\Gamma(D^0 K^+)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ_2
-------	------	-------------	------	---------	---------------------

^{• • •} We do not use the following data for averages, fits, limits, etc. ^{• • •}

$1.04 \pm 0.17 \pm 0.20$ 2241 8 AUBERT 09AR BABR $e^+ e^- \rightarrow D^{(*)} K X$

⁸ From the $D^{*0} K^+$ and $D^0 K^+$, where $D^{*0} \rightarrow D^0 \pi^0$.

$\Gamma(D^{*+} K_S^0)/\Gamma(D^+ K_S^0)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_3
-------	------	-------------	------	---------	---------------------

^{• • •} We do not use the following data for averages, fits, limits, etc. ^{• • •}

$1.38 \pm 0.35 \pm 0.49$ 881 9 AUBERT 09AR BABR $e^+ e^- \rightarrow D^{(*)} K X$

⁹ From the $D^{*+} K_S^0$ and $D^+ K_S^0$, where $D^{*+} \rightarrow D^+ \pi^0$.

$D_{sJ}^*(2860)^\pm$ REFERENCES

AAIJ	12AU JHEP 1210 151	R. Aaij <i>et al.</i>
AUBERT	09AR PR D80 092003	B. Aubert <i>et al.</i>
AUBERT,BE	06E PRL 97 222001	B. Aubert <i>et al.</i>

(LHCb Collab.)
(BABAR Collab.)
(BABAR Collab.)

NODE=M197

 $D_{sJ}(3040)^{\pm}$ $I(J^P) = 0(?)$

OMITTED FROM SUMMARY TABLE

Observed by AUBERT 09AR in inclusive production of $D^* K$ in
 $e^+ e^-$ annihilation.

NODE=M197

 $D_{sJ}(3040)^{+}$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$3044 \pm 8^{+30}_{-5}$	AUBERT	09AR BABR	$e^+ e^- \rightarrow D^* K X$

NODE=M197M

NODE=M197M

 $D_{sJ}(3040)^{+}$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
$239 \pm 35^{+46}_{-42}$	AUBERT	09AR BABR	$e^+ e^- \rightarrow D^* K X$

NODE=M197W

NODE=M197W

 $D_{sJ}(3040)^{\pm}$ DECAY MODES

Mode	
Γ_1	$D^* K$
Γ_2	$D^{*0} K^+$
Γ_3	$D^{*+} K_S^0$

NODE=M197215; NODE=M197

 $D_{sJ}(3040)^{\pm}$ REFERENCESAUBERT 09AR PR D80 092003 B. Aubert *et al.* (BABAR Collb.)

NODE=M197

REFID=53135

— OTHER RELATED PAPERS —

SUN 09 PR D80 074037 Z.-F. Sun, X. Lin

REFID=53128

**BOTTOM MESONS
($B = \pm 1$)** $B^+ = u\bar{b}, B^0 = d\bar{b}, \bar{B}^0 = \bar{d}b, B^- = \bar{u}b,$ similarly for B^* 's

NODE=MXXX045

NODE=MXXX045

**BOTTOM, STRANGE MESONS
($B = \pm 1, S = \mp 1$)** $B_s^0 = s\bar{b}, \bar{B}_s^0 = \bar{s}b,$ similarly for B_s^* 's

NODE=MXXX046

NODE=MXXX046

**BOTTOM, CHARMED MESONS
($B = C = \pm 1$)** $B_c^+ = c\bar{b}, B_c^- = \bar{c}b,$ similarly for B_c^* 's

NODE=MXXX049

NODE=MXXX049

$c\bar{c}$ MESONS

NODE=MXXX025

A REVIEW GOES HERE – Check our WWW List of
Reviews

NODE=M826

 $\eta_c(1S)$ $I^G(J^{PC}) = 0^+(0^-+)$

NODE=M026

$\eta_c(1S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2983.7 ± 0.7 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below. [2981.0 ± 1.1 MeV OUR 2012 AVERAGE Scale factor = 1.7]
2984.3 ± 0.6 ± 0.6		1,2 ABLIKIM	12F BES3	$\psi(2S) \rightarrow \gamma \eta_c$
2984.49 ± 1.16 ± 0.52	832	3 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma$ hadrons
2984.5 ± 0.8 ± 3.1	11k	DEL-AMO-SA..11M	BABR	$\gamma \gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
2985.4 ± 1.5 ± 0.5	920	2 VINOKUROVA	11 BELL	$B^\pm \rightarrow K^\pm(K_S^0 K^\pm \pi^\mp)$
2982.2 ± 0.4 ± 1.6	14k	4 LEES	10 BABR	$e^+ e^- \rightarrow K_S^0 K^\pm \pi^\mp$
2985.8 ± 1.5 ± 3.1	0.9k	AUBERT	08AB BABR	$B \rightarrow \eta_c(1S) K^{(*)} \rightarrow K\bar{K} \pi K^{(*)}$
2986.1 ± 1.0 ± 2.5	7.5k	UEHARA	08 BELL	$\gamma \gamma \rightarrow \eta_c \rightarrow$ hadrons
2970 ± 5 ± 6	501	5 ABE	07 BELL	$e^+ e^- \rightarrow J/\psi(c\bar{c})$
2971 ± 3 ± 2	195	WU	06 BELL	$B^+ \rightarrow p\bar{p} K^+$
2974 ± 7 ± 2	20	WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda} K^+$
2981.8 ± 1.3 ± 1.5	592	ASNER	04 CLEO	$\gamma \gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
2984.1 ± 2.1 ± 1.0	190	6 AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2982.5 ± 0.4 ± 1.4	12k	7 DEL-AMO-SA..11M	BABR	$\gamma \gamma \rightarrow K_S^0 K^\pm \pi^\mp$
2982.2 ± 0.6		8 MITCHELL	09 CLEO	$e^+ e^- \rightarrow \gamma X$
2982 ± 5	270	9 AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
2982.5 ± 1.1 ± 0.9	2.5k	10 AUBERT	04D BABR	$\gamma \gamma \rightarrow \eta_c(1S) \rightarrow K\bar{K}\pi$
2977.5 ± 1.0 ± 1.2		8,11 BAI	03 BES	$J/\psi \rightarrow \gamma \eta_c$
2979.6 ± 2.3 ± 1.6	180	12 FANG	03 BELL	$B \rightarrow \eta_c K$
2976.3 ± 2.3 ± 1.2		8,13 BAI	00F BES	$J/\psi, \psi(2S) \rightarrow \gamma \eta_c$
2976.6 ± 2.9 ± 1.3	140	8,14 BAI	00F BES	$J/\psi \rightarrow \gamma \eta_c$
2980.4 ± 2.3 ± 0.6		15 BRANDENB...	00B CLE2	$\gamma \gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$
2975.8 ± 3.9 ± 1.2		14 BAI	99B BES	Sup. by BAI 00F
2999 ± 8	25	ABREU	980 DLPH	$e^+ e^- \rightarrow e^+ e^- +$ hadrons
2988.3 ± 3.3		ARMSTRONG	95F E760	$\bar{p}p \rightarrow \gamma \gamma$
2974.4 ± 1.9		8,16 BISELLO	91 DM2	$J/\psi \rightarrow \eta_c \gamma$
2969 ± 4 ± 4	80	8 BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
2956 ± 12 ± 12		8 BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$
2982.6 ± 2.7	12	BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma \gamma$
2980.2 ± 1.6		8,16 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$
2984 ± 2.3 ± 4.0		8 GAISER	86 CBAL	$J/\psi \rightarrow \gamma X, \psi(2S) \rightarrow \gamma X$
2976 ± 8		8,17 BALTRUSAIT..84	MRK3	$J/\psi \rightarrow 2\phi\gamma$
2982 ± 8	18	18 HIMEL	80B MRK2	$e^+ e^-$
2980 ± 9		18 PARTRIDGE	80B CBAL	$e^+ e^-$

NODE=M026M

NODE=M026M
NEW

OCCUR=2

OCCUR=2

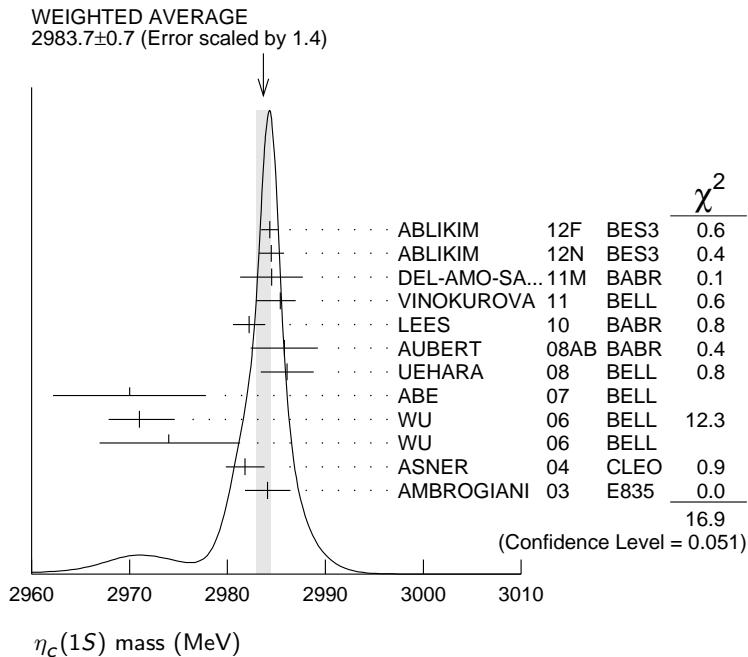
OCCUR=2

OCCUR=3

- 1 From a simultaneous fit to six decay modes of the η_c .
 2 Accounts for interference with non-resonant continuum.
 3 With floating width.
 4 Taking into account interference with the non-resonant $J^P = 0^-$ amplitude.
 5 From a fit of the J/ψ recoil mass spectrum. Supersedes ABE,K 02 and ABE 04G.
 6 Using mass of $\psi(2S) = 3686.00$ MeV.
 7 Not independent from the measurements reported by LEES 10.
 8 MITCHELL 09 observes a significant asymmetry in the lineshapes of $\psi(2S) \rightarrow \gamma\eta_c$ and $J/\psi \rightarrow \gamma\eta_c$ transitions. If ignored, this asymmetry could lead to significant bias whenever the mass and width are measured in $\psi(2S)$ or J/ψ radiative decays.
 9 From the fit of the kaon momentum spectrum. Systematic errors not evaluated.
 10 Superseded by LEES 10.
 11 From a simultaneous fit of five decay modes of the η_c .
 12 Superseded by VINOKUROVA 11.
 13 Weighted average of the $\psi(2S)$ and $J/\psi(1S)$ samples. Using an η_c width of 13.2 MeV.
 14 Average of several decay modes. Using an η_c width of 13.2 MeV.
 15 Superseded by ASNER 04.
 16 Average of several decay modes.
 17 $\eta_c \rightarrow \phi\phi$.
 18 Mass adjusted by us to correspond to $J/\psi(1S)$ mass = 3097 MeV.

NODE=M026M;LINKAGE=BL
 NODE=M026M;LINKAGE=VA
 NODE=M026M;LINKAGE=AL
 NODE=M026M;LINKAGE=LE
 NODE=M026M;LINKAGE=EB
 NODE=M026M;LINKAGE=BG
 NODE=M026M;LINKAGE=DE
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NODE=M026M;LINKAGE=AU
 NODE=M026M;LINKAGE=UB
 NODE=M026M;LINKAGE=AK
 NODE=M026M;LINKAGE=FA
 NODE=M026M;LINKAGE=KZ
 NODE=M026M;LINKAGE=C1
 NODE=M026M;LINKAGE=NN
 NODE=M026M;LINKAGE=A
 NODE=M026M;LINKAGE=B
 NODE=M026M;LINKAGE=M



$\eta_c(1S)$ WIDTH					
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
32.0 ± 0.9 OUR FIT					NODE=M026W
[29.7 ± 1.0 MeV OUR 2012 FIT]					NODE=M026W
32.2 ± 1.0 OUR AVERAGE				Error includes scale factor of 1.2. [29.7 ± 2.1 MeV OUR 2012 AVERAGE Scale factor = 2.0]	NEW
$32.0 \pm 1.2 \pm 1.0$	1,2	ABLIKIM	12F BES3	$\psi(2S) \rightarrow \gamma\eta_c$	
$36.4 \pm 3.2 \pm 1.7$	832	ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma$ hadrons	
$36.2 \pm 2.8 \pm 3.0$	11k	DEL-AMO-SA..	11M BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$	
$35.1 \pm 3.1^{+1.0}_{-1.6}$	920	VINOKUROVA	11 BELL	$B^\pm \rightarrow K^\pm(K_S^0 K^\pm \pi^\mp)$	
$31.7 \pm 1.2 \pm 0.8$	14k	LEES	10 BABR	$10.6 \frac{e^+ e^-}{e^+ e^-} \rightarrow K_S^0 K^\pm \pi^\mp$	
$36.3^{+3.7}_{-3.6} \pm 4.4$	0.9k	AUBERT	08AB BABR	$B \rightarrow \eta_c(1S) K^{(*)} \rightarrow K\bar{K}\pi K^{(*)}$	
$28.1 \pm 3.2 \pm 2.2$	7.5k	UEHARA	08 BELL	$\gamma\gamma \rightarrow \eta_c \rightarrow$ hadrons	
$48^{+8}_{-7} \pm 5$	195	WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$	
$40 \pm 19 \pm 5$	20	WU	06 BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$	OCCUR=2
$24.8 \pm 3.4 \pm 3.5$	592	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$	
$20.4^{+7.7}_{-6.7} \pm 2.0$	190	AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$	
$23.9^{+12.6}_{-7.1}$		ARMSTRONG	95F E760	$\bar{p}p \rightarrow \gamma\gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

32.1 ± 1.1 ± 1.3	12k	5 DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$	OCCUR=2
34.3 ± 2.3 ± 0.9	2.5k	6 AUBERT	04D	BABR $\gamma\gamma \rightarrow \eta_c(1S) \rightarrow K\bar{K}\pi$	
17.0 ± 3.7 ± 7.4		7 BAI	03	BES $J/\psi \rightarrow \gamma\eta_c$	
29 ± 8 ± 6	180	8 FANG	03	BELL $B \rightarrow \eta_c K$	
11.0 ± 8.1 ± 4.1		9 BAI	00F	BES $J/\psi \rightarrow \gamma\eta_c$ and $\psi(2S) \rightarrow \gamma\eta_c$	
27.0 ± 5.8 ± 1.4		10 BRANDENB...	00B	CLE2 $\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$	
7.0 ± 7.5 7.0	12	BAGLIN	87B	SPEC $\bar{p}p \rightarrow \gamma\gamma$	
10.1 ± 33.0 8.2	23	11 BALTRUSAIT...	86	MRK3 $J/\psi \rightarrow \gamma p\bar{p}$	
11.5 ± 4.5		GAISER	86	CBAL $J/\psi \rightarrow \gamma X, \psi(2S) \rightarrow \gamma X$	
< 40 90% CL	18	HIMEL	80B	MRK2 $e^+ e^-$	
< 20 90% CL		PARTRIDGE	80B	CBAL $e^+ e^-$	

1 From a simultaneous fit to six decay modes of the η_c .

2 Accounts for interference with non-resonant continuum.

3 With floating mass.

4 Taking into account interference with the non-resonant $J^P = 0^-$ amplitude.

5 Not independent from the measurements reported by LEES 10.

6 Superseded by LEES 10.

7 From a simultaneous fit of five decay modes of the η_c .

8 Superseded by VINOKUROVA 11.

9 From a fit to the 4-prong invariant mass in $\psi(2S) \rightarrow \gamma\eta_c$ and $J/\psi(1S) \rightarrow \gamma\eta_c$ decays.

10 Superseded by ASNER 04.

11 Positive and negative errors correspond to 90% confidence level.

NODE=M026W;LINKAGE=BL
NODE=M026W;LINKAGE=VA
NODE=M026W;LINKAGE=AL
NODE=M026W;LINKAGE=LE
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NODE=M026W;LINKAGE=AK
NODE=M026W;LINKAGE=FA
NODE=M026W;LINKAGE=KZ
NODE=M026W;LINKAGE>NN
NODE=M026W;LINKAGE=L

NODE=M026215;NODE=M026

$\eta_c(1S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Decays involving hadronic resonances		
$\Gamma_1 \eta'(958)\pi\pi$	(4.1 ± 1.7) %	
$\Gamma_2 \rho\rho$	(1.8 ± 0.5) %	
$\Gamma_3 K^*(892)^0 K^- \pi^+$ c.c.	(2.0 ± 0.7) %	
$\Gamma_4 K^*(892) \bar{K}^*(892)$	(7.1 ± 1.3) × 10 ⁻³	
$\Gamma_5 K^{*0} \bar{K}^{*0} \pi^+ \pi^-$	(1.1 ± 0.5) %	
$\Gamma_6 \phi K^+ K^-$	(2.9 ± 1.4) × 10 ⁻³	
$\Gamma_7 \phi\phi$	(1.76 ± 0.20) × 10 ⁻³	
$\Gamma_8 \phi 2(\pi^+ \pi^-)$	< 3.5 × 10 ⁻³	90%
$\Gamma_9 a_0(980)\pi$	< 2 %	90%
$\Gamma_{10} a_2(1320)\pi$	< 2 %	90%
$\Gamma_{11} K^*(892) \bar{K}^+$ c.c.	< 1.28 %	90%
$\Gamma_{12} f_2(1270)\eta$	< 1.1 %	90%
$\Gamma_{13} \omega\omega$	< 3.1 × 10 ⁻³	90%
$\Gamma_{14} \omega\phi$	< 1.7 × 10 ⁻³	90%
$\Gamma_{15} f_2(1270)f_2(1270)$	(9.8 ± 2.5) × 10 ⁻³	
$\Gamma_{16} f_2(1270)f'_2(1525)$	(9.7 ± 3.2) × 10 ⁻³	
Decays into stable hadrons		
$\Gamma_{17} K\bar{K}\pi$	(7.3 ± 0.5) %	
$\Gamma_{18} \eta\pi^+\pi^-$	(1.7 ± 0.5) %	
$\Gamma_{19} \eta 2(\pi^+ \pi^-)$	(4.4 ± 1.3) %	
$\Gamma_{20} K^+ K^- \pi^+ \pi^-$	(6.9 ± 1.1) × 10 ⁻³	
$\Gamma_{21} K^+ K^- \pi^+ \pi^- \pi^0$	(3.5 ± 0.6) %	
$\Gamma_{22} K^0 K^- \pi^+ \pi^- \pi^+ +$ c.c.	(5.6 ± 1.5) %	
$\Gamma_{23} K^+ K^- 2(\pi^+ \pi^-)$	(7.5 ± 2.4) × 10 ⁻³	
$\Gamma_{24} 2(K^+ K^-)$	(1.47 ± 0.31) × 10 ⁻³	
$\Gamma_{25} \pi^+ \pi^- \pi^0 \pi^0$	(4.7 ± 1.0) %	
$\Gamma_{26} 2(\pi^+ \pi^-)$	(9.7 ± 1.2) × 10 ⁻³	
$\Gamma_{27} 2(\pi^+ \pi^- \pi^0)$	(17.4 ± 3.3) %	
$\Gamma_{28} 3(\pi^+ \pi^-)$	(1.7 ± 0.4) %	
$\Gamma_{29} p\bar{p}$	(1.51 ± 0.16) × 10 ⁻³	
$\Gamma_{30} p\bar{p}\pi^0$	(3.6 ± 1.3) × 10 ⁻³	
$\Gamma_{31} \Lambda\bar{\Lambda}$	(1.08 ± 0.24) × 10 ⁻³	
$\Gamma_{32} K\bar{K}\eta$	(10 ± 5) × 10 ⁻³	
$\Gamma_{33} \pi^+ \pi^- p\bar{p}$	(5.3 ± 1.8) × 10 ⁻³	

NODE=M026;CLUMP=A
DESIG=24
DESIG=19
DESIG=26
DESIG=18
DESIG=57
DESIG=28
DESIG=17
DESIG=58
DESIG=21
DESIG=22
DESIG=40
DESIG=23
DESIG=20
DESIG=47
DESIG=46
DESIG=59

NODE=M026;CLUMP=B
DESIG=14
DESIG=16
DESIG=61
DESIG=15
DESIG=60
DESIG=62
DESIG=55
DESIG=27
DESIG=63
DESIG=11
DESIG=64
DESIG=56
DESIG=12
DESIG=65
DESIG=45
DESIG=25
DESIG=13

Radiative decays

$\Gamma_{34} \gamma\gamma$ $(1.57 \pm 0.12) \times 10^{-4}$

**Charge conjugation (C), Parity (P),
Lepton family number (LF) violating modes**

Γ_{35}	$\pi^+ \pi^-$	$P, CP < 1.1$	$\times 10^{-4}$	90%	
Γ_{36}	$\pi^0 \pi^0$	$P, CP < 3.5$	$\times 10^{-5}$	90%	
Γ_{37}	$K^+ K^-$	$P, CP < 6$	$\times 10^{-4}$	90%	
Γ_{38}	$K_S^0 K_S^0$	$P, CP < 3.1$	$\times 10^{-4}$	90%	

NODE=M026;CLUMP=C
DESIG=31

NODE=M026;CLUMP=D

CONSTRAINED FIT INFORMATION

An overall fit to the total width, 8 combinations of partial widths obtained from integrated cross section, and 17 branching ratios uses 79 measurements and one constraint to determine 12 parameters. The overall fit has a $\chi^2 = 112.1$ for 68 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_7	18							
x_{15}		3	6						
x_{17}		22	42	7					
x_{20}		11	21	4	25				
x_{24}		9	16	3	25	10			
x_{26}		14	25	5	31	16	12		
x_{29}		14	26	5	36	16	13	20	
x_{31}		3	6	1	9	4	3	5	25
x_{34}		-29	-54	-10	-66	-34	-27	-41	-46
Γ		-2	-3	-1	-4	-2	-2	-2	-11
		x_4	x_7	x_{15}	x_{17}	x_{20}	x_{24}	x_{26}	x_{29}
									x_{31}
									x_{34}

Mode	Rate (MeV)								
Γ_4 $K^*(892)\bar{K}^*(892)$	0.23	± 0.04							
Γ_7 $\phi\phi$	0.056	± 0.007							
Γ_{15} $f_2(1270)f_2(1270)$	0.31	± 0.08							
Γ_{17} $K\bar{K}\pi$	2.35	± 0.17							
Γ_{20} $K^+ K^- \pi^+ \pi^-$	0.222	± 0.035							
Γ_{24} $2(K^+ K^-)$	0.047	± 0.010							
Γ_{26} $2(\pi^+ \pi^-)$	0.31	± 0.04							
Γ_{29} $p\bar{p}$	0.049	± 0.005							
Γ_{31} $\Lambda\bar{\Lambda}$	0.035	± 0.008							
Γ_{34} $\gamma\gamma$	0.0050	± 0.0004							

DESIG=18

DESIG=17

DESIG=46

DESIG=14

DESIG=15

DESIG=27

DESIG=11

DESIG=12

DESIG=45

DESIG=31

 $\eta_c(1S)$ PARTIAL WIDTHS **$\Gamma(\gamma\gamma)$**

VALUE (keV) EVTS DOCUMENT ID TECN COMMENT

5.0 ± 0.4 OUR FIT

[5.3 ± 0.5 keV OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

5.2 ± 1.2	273 ± 43	1,2 AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
5.5 ± 1.2 ± 1.8	157 ± 33	3 KUO	05 BELL	$\gamma\gamma \rightarrow p\bar{p}$
7.4 ± 0.4 ± 2.3		4 ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
13.9 ± 2.0 ± 3.0	41	5 ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow \eta_c$
3.8 ± 1.1 ± 1.9	190	6 AMBROGIANI	03 E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$
7.6 ± 0.8 ± 2.3		4,7 BRANDENB...	00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$
6.9 ± 1.7 ± 2.1	76	8 ACCIARRI	99T L3	$e^+ e^- \rightarrow e^+ e^- \eta_c$
27 ± 16 ± 10	5	4 SHIRAI	98 AMY	$58 e^+ e^-$

NODE=M026217

NODE=M026W1

NODE=M026W1

NEW

6.7 ± 2.4	1.7 ± 2.3	³ ARMSTRONG 95F E760	$\bar{p}p \rightarrow \gamma\gamma$
11.3 ± 4.2		⁹ ALBRECHT 94H ARG	$e^+e^- \rightarrow e^+e^-\eta_c$
$8.0 \pm 2.3 \pm 2.4$	17	¹⁰ ADRIANI 93N L3	$e^+e^- \rightarrow e^+e^-\eta_c$
$5.9 \pm 2.1 \pm 1.9$		⁶ CHEN 90B CLEO	$e^+e^- \rightarrow e^+e^-\eta_c$
6.4 ± 5.0	3.4	¹¹ AIHARA 88D TPC	$e^+e^- \rightarrow e^+e^-X$
4.3 ± 3.4	3.7 ± 2.4	³ BAGLIN 87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$
28 ± 15		^{4,12} BERGER 86 PLUT	$\gamma\gamma \rightarrow K\bar{K}\pi$

¹ Calculated by us using $\Gamma(\eta_c \rightarrow K\bar{K}\pi) \times \Gamma(\eta_c \rightarrow \gamma\gamma) / \Gamma = 0.44 \pm 0.05$ keV from PDG 06 and $B(\eta_c \rightarrow K\bar{K}\pi) = (8.5 \pm 1.8)\%$ from AUBERT 06E.

² Systematic errors not evaluated.

³ Normalized to $B(\eta_c \rightarrow p\bar{p}) = (1.3 \pm 0.4) \times 10^{-3}$.

⁴ Normalized to $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$.

⁵ Average of $K_S^0 K^\pm \pi^\mp$, $\pi^+ \pi^- K^+ K^-$, and $2(K^+ K^-)$ decay modes.

⁶ Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.

⁷ Superseded by ASNER 04.

⁸ Normalized to the sum of 9 branching ratios.

⁹ Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow \phi\phi)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.

¹⁰ Superseded by ACCIARRI 99T.

¹¹ Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow 2K^+ 2K^-)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.

¹² Re-evaluated by AIHARA 88D.

$\eta_c(1S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_{34}/\Gamma$				
VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<39	90	< 1556	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(\pi^+ \pi^-)$

$\Gamma(K^*(892)\bar{K}^*(892)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_4\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
35 ± 6 OUR FIT [36 ± 6 eV OUR 2012 FIT]				
32.4 ± 4.2 ± 5.8	882 ± 115	UEHARA	08	BELL $\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_7\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
8.9 ± 0.8 OUR FIT [10.2 ± 1.4 eV OUR 2012 FIT]				
7.8 ± 0.9 OUR AVERAGE [6.8 ± 1.8 eV OUR 2012 AVERAGE]				

7.75 ± 0.66 ± 0.62	386 ± 31	¹ LIU	12B BELL	$\gamma\gamma \rightarrow 2(K^+ K^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.8 ± 1.2 ± 1.3	132 ± 23	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(K^+ K^-)$

¹ Supersedes UEHARA 08. Using $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$.

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{13}\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
8.67 ± 2.86 ± 0.96	85 ± 29	¹ LIU	12B BELL	$\gamma\gamma \rightarrow 2(\pi^+ \pi^- \pi^0)$
¹ Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7)\%$.				

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{14}\Gamma_{34}/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.49	90	¹ LIU	12B BELL	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

¹ Using $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$ and $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7)\%$.

$\Gamma(f_2(1270)f_2(1270)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{15}\Gamma_{34}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
49 ± 13 OUR FIT [51 ± 13 eV OUR 2012 FIT]				
69 ± 17 ± 12	3182 ± 766	UEHARA	08	BELL $\gamma\gamma \rightarrow 2(\pi^+ \pi^-)$

NODE=M026W1;LINKAGE=AU

NODE=M026W1;LINKAGE=NS

NODE=M026W1;LINKAGE=N3

NODE=M026W1;LINKAGE=N2

NODE=M026W;LINKAGE=FF

NODE=M026W1;LINKAGE=N6

NODE=M026W1;LINKAGE=NN

NODE=M026W1;LINKAGE=N1

NODE=M026W1;LINKAGE=N5

NODE=M026W1;LINKAGE=WD

NODE=M026W1;LINKAGE=N4

NODE=M026W1;LINKAGE=A

NODE=M026220

NODE=M026G09

NODE=M026G09

NODE=M026G08

NODE=M026G08

NEW

NODE=M026G07;LINKAGE=LI

NODE=M026G03

NODE=M026G03

NODE=M026G03;LINKAGE=LI

NODE=M026G04

NODE=M026G04

NODE=M026G04;LINKAGE=LI

NODE=M026G19

NODE=M026G19

NEW

$\Gamma(f_2(1270)f'_2(1525)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{16}\Gamma_{34}/\Gamma$
49 ± 9 ± 13	1128 ± 206	UEHARA	08	BELL	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$

 $\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (keV)	CL% EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{17}\Gamma_{34}/\Gamma$
-------------	----------	-------------	------	---------	---------------------------------

0.369 ± 0.021 OUR FIT[0.377 ± 0.021 keV OUR 2012 FIT]**0.407 ± 0.027 OUR AVERAGE** Error includes scale factor of 1.2.

$0.374 \pm 0.009 \pm 0.031$	14k	1 LEES	10 BABR	$10.6 e^+ e^- \rightarrow e^+ e^- K_S^0 K^\pm \pi^\mp$	
$0.407 \pm 0.022 \pm 0.028$		2,3 ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$	
$0.60 \pm 0.12 \pm 0.09$	41	3,4 ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$	
$1.47 \pm 0.87 \pm 0.27$		3 SHIRAI	98 AMY	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$	
0.84 ± 0.21		3 ALBRECHT	94H ARG	$\gamma\gamma \rightarrow K^\pm K_S^0 \pi^\mp$	
$0.60 \pm 0.23 \pm 0.20$		3 CHEN	90B CLEO	$\gamma\gamma \rightarrow \eta_c K^\pm K_S^0 \pi^\mp$	
$1.06 \pm 0.41 \pm 0.27$	11	3 BRAUNSCH...	89 TASS	$\gamma\gamma \rightarrow K\bar{K}\pi$	
$1.5 \pm 0.60 \pm 0.3$	7	3 BERGER	86 PLUT	$\gamma\gamma \rightarrow K\bar{K}\pi$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.386 \pm 0.008 \pm 0.021$	12k	5 DEL-AMO-SA..11M BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$	
$0.418 \pm 0.044 \pm 0.022$		3,6 BRANDENB... 00B CLE2	$\gamma\gamma \rightarrow \eta_c \rightarrow K^\pm K_S^0 \pi^\mp$	

<0.63	95	3 BEHREND	89 CELL	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
<4.4	95	ALTHOFF	85B TASS	$\gamma\gamma \rightarrow K\bar{K}\pi$

1 From the corrected and unfolded mass spectrum.

2 Calculated by us from the value reported in ASNER 04 that assumes $B(\eta_c \rightarrow K\bar{K}\pi) = 5.5 \pm 1.7\%$ 3 We have multiplied $K^\pm K_S^0 \pi^\mp$ measurement by 3 to obtain $K\bar{K}\pi$.4 Calculated by us from the value reported in ABDALLAH 03J, which uses $B(\eta_c \rightarrow K_S^0 K^\pm \pi^\mp) = (1.5 \pm 0.4)\%$.

5 Not independent from the measurements reported by LEES 10.

6 Superseded by ASNER 04.

 $\Gamma(K^+ K^- \pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{20}\Gamma_{34}/\Gamma$
------------	------	-------------	------	---------	---------------------------------

35 ± 5 OUR FIT[32 ± 6 eV OUR 2012 FIT]**27 ± 6 OUR AVERAGE**

$25.7 \pm 3.2 \pm 4.9$	2019 ± 248	UEHARA	08 BELL	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$	
$280 \pm 100 \pm 60$	42	1 ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$	
$170 \pm 80 \pm 20$	13.9 ± 6.6	ALBRECHT	94H ARG	$\gamma\gamma \rightarrow \pi^+ \pi^- K^+ K^-$	

1 Calculated by us from the value reported in ABDALLAH 03J, which uses $B(\eta_c \rightarrow \pi^+ \pi^- K^+ K^-) = (2.0 \pm 0.7)\%$. $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{21}\Gamma_{34}/\Gamma$
-------------	------	-------------	------	---------	---------------------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.190 \pm 0.006 \pm 0.028$	11k	1 DEL-AMO-SA..11M BABR	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	
-----------------------------	-----	------------------------	--	--

1 Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

 $\Gamma(2(K^+ K^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{24}\Gamma_{34}/\Gamma$
------------	------	-------------	------	---------	---------------------------------

7.4 ± 1.5 OUR FIT[7.0 ± 1.6 eV OUR 2012 FIT]**5.8 ± 1.9 OUR AVERAGE**

$5.6 \pm 1.1 \pm 1.6$	216 ± 42	UEHARA	08 BELL	$\gamma\gamma \rightarrow 2(K^+ K^-)$	
$350 \pm 90 \pm 60$	46	1 ABDALLAH	03J DLPH	$\gamma\gamma \rightarrow 2(K^+ K^-)$	
$231 \pm 90 \pm 23$	9.1 ± 3.3	2 ALBRECHT	94H ARG	$\gamma\gamma \rightarrow 2(K^+ K^-)$	

1 Calculated by us from the value reported in ABDALLAH 03J, which uses $B(\eta_c \rightarrow 2(K^+ K^-)) = (2.1 \pm 1.2)\%$.2 Includes all topological modes except $\eta_c \rightarrow \phi\phi$.

NODE=M026G20

NODE=M026G20

NODE=M026G14

NODE=M026G14

NEW

NODE=M026G14;LINKAGE=LE

NODE=M026G14;LINKAGE=AA

NODE=M026G14;LINKAGE=C

NODE=M026G;LINKAGE=BB

NODE=M026G14;LINKAGE=DE

NODE=M026G14;LINKAGE=NN

NODE=M026G15

NODE=M026G15

NEW

NODE=M026G;LINKAGE=CC

NODE=M026G02

NODE=M026G02

NODE=M026G02;LINKAGE=DE

NODE=M026G27

NODE=M026G27

NEW

NODE=M026G;LINKAGE=DD

NODE=M026G;LINKAGE=EE

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV) EVTS

49 ± 6 OUR FIT

[45 ± 6 eV OUR 2012 FIT]

42 ± 6 OUR AVERAGE40.7 ± 3.7 ± 5.3 5381 ± 492
180 ± 70 ± 20 21.4 ± 8.6

DOCUMENT ID TECN COMMENT

UEHARA 08 BELL $\gamma\gamma \rightarrow 2(\pi^+\pi^-)$
ALBRECHT 94H ARG $\gamma\gamma \rightarrow 2(\pi^+\pi^-)$ $\Gamma_{26}\Gamma_{34}/\Gamma$

NODE=M026G11

NODE=M026G11

NEW

 $\Gamma(p\bar{p}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV) EVTS

7.6 ± 0.8 OUR FIT

[7.4 ± 0.8 eV OUR 2012 FIT]

7.20 ± 1.53 ± 0.67

157 ± 33

DOCUMENT ID TECN COMMENT

 $\Gamma_{29}\Gamma_{34}/\Gamma$

NODE=M026G01

NODE=M026G01

NEW

4.6 +1.3 -1.1 ± 0.4

190

1 AMBROGIANI 03 E835 $\bar{p}p \rightarrow \gamma\gamma$

8.1 +2.9 -2.0

1 ARMSTRONG 95F E760 $\bar{p}p \rightarrow \gamma\gamma$ 1 Not independent from the $\Gamma_{\gamma\gamma}$ reported by the same experiment. $\eta_c(1S)$ BRANCHING RATIOS

— HADRONIC DECAYS —

 $\Gamma(\eta'(958)\pi\pi)/\Gamma_{\text{total}}$

VALUE EVTS

0.041 ± 0.017 14 1 BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c\gamma$ Γ_1/Γ

NODE=M026G01;LINKAGE=GG

1 The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. $\Gamma(\rho\rho)/\Gamma_{\text{total}}$ VALUE (units 10^{-3}) CL% EVTS**18 ± 5 OUR AVERAGE**12.6 ± 3.8 ± 5.1 72 1 ABLIKIM 05L BES2 $J/\psi \rightarrow \pi^+\pi^-\pi^+\pi^-\gamma$
26.0 ± 2.4 ± 8.8 113 1 BISELLO 91 DM2 $J/\psi \rightarrow \gamma\rho^0\rho^0$
23.6 ± 10.6 ± 8.2 32 1 BISELLO 91 DM2 $J/\psi \rightarrow \gamma\rho^+\rho^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •<14 90 1 BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c\gamma$ Γ_2/Γ

NODE=M026225

NODE=M026305

NODE=M026R14

NODE=M026R14

NODE=M026R14;LINKAGE=E

1 The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages. $\Gamma(K^*(892)^0 K^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$

VALUE EVTS

0.02 ± 0.007 63 1,2 BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c\gamma$ Γ_3/Γ

NODE=M026R9

NODE=M026R9

OCCUR=2

NODE=M026R9;LINKAGE=E

1 BALTRUSAITS 86 has an error according to Partridge.

2 The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. $\Gamma(K^*(892)\bar{K}^*(892))/\Gamma_{\text{total}}$ VALUE (units 10^{-4}) EVTS**71 ± 13 OUR FIT**[(68 ± 13) × 10⁻⁴ OUR 2012 FIT]**91 ± 26 OUR AVERAGE**108 ± 25 ± 44 60 1 ABLIKIM 05L BES2 $J/\psi \rightarrow K^+K^-\pi^+\pi^-\gamma$
82 ± 28 ± 27 14 1 BISELLO 91 DM2 $e^+e^- \rightarrow \gamma K^+K^-\pi^+\pi^-$
90 ± 50 9 1 BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c\gamma$ Γ_4/Γ

NODE=M026R16

NODE=M026R16

NODE=M026R;LINKAGE=03

NODE=M026R16;LINKAGE=E

NODE=M026R8

NODE=M026R8

NEW

NODE=M026R8;LINKAGE=E

1 The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages. $\Gamma(K^{*0}\bar{K}^{*0}\pi^+\pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-4}) EVTS**112 ± 47 ± 25** 45 1 ABLIKIM 06A BES2 $J/\psi \rightarrow K^{*0}\bar{K}^{*0}\pi^+\pi^- \gamma$ Γ_5/Γ

NODE=M026R25

NODE=M026R25

1 ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow K^{*0}\bar{K}^{*0}\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (1.91 \pm 0.64 \pm 0.48) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M026R25;LINKAGE=AB

$\Gamma(\phi K^+ K^-)/\Gamma_{\text{total}}$	Γ_6/Γ				
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$2.9^{+0.9}_{-0.8} \pm 1.1$	$14.1^{+4.4}_{-3.7}$	¹ HUANG	03	BELL	$B^+ \rightarrow (\phi K^+ K^-) K^+$

¹ Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$	Γ_7/Γ				
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

17.6 ± 2.0 OUR FIT
[(19.4 ± 3.0) $\times 10^{-4}$ OUR 2012 FIT]

30 ± 5 OUR AVERAGE	Γ_7/Γ				
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
25.3 \pm 5.1 \pm 9.1	72	¹ ABLIKIM	05L	BES2	$J/\psi \rightarrow K^+ K^- K^+ K^- \gamma$
26 \pm 9	357 ± 64	¹ BAI	04	BES	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
31 \pm 7 \pm 10	19	¹ BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
30 \pm 18 \pm 10	5	¹ BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- K^0_S K^0_L$
74 \pm 18 \pm 24	80	¹ BAI	90B	MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
67 \pm 21 \pm 24		¹ BAI	90B	MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^0_S K^0_L$

• • • We do not use the following data for averages, fits, limits, etc. • • •

18 \pm 8 \pm 7	$7.0^{+3.0}_{-2.3}$	² HUANG	03	BELL	$B^+ \rightarrow (\phi\phi) K^+$
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¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

² Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi\phi)/\Gamma(K\bar{K}\pi)$	Γ_7/Γ_{17}				
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

0.0240 ± 0.0026 OUR FIT
[0.027 ± 0.004 OUR 2012 FIT]

$0.044^{+0.012}_{-0.010}$ OUR AVERAGE	Γ_7/Γ_{17}				
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.055 \pm 0.014 \pm 0.005	AUBERT,B	04B	BABR	$B^\pm \rightarrow K^\pm \eta_c$	
0.032 \pm 0.014 \pm 0.009	7	¹ HUANG	03	BELL	$B^\pm \rightarrow K^\pm \phi\phi$

¹ Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\phi 2(\pi^+\pi^-))/\Gamma_{\text{total}}$	Γ_8/Γ				
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

¹ ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow \phi 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] < 0.603 \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 1.7 \times 10^{-2}$.

$\Gamma(a_0(980)\pi)/\Gamma_{\text{total}}$	Γ_9/Γ				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

² We are assuming $B(a_0(980) \rightarrow \eta\pi) > 0.5$.

$\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$	Γ_{10}/Γ				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(K^*(892)\bar{K} + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{11}/Γ				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

<0.0128	90	BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^0_S K^\pm \pi^\mp$
<0.0132	90	¹ BISELLO	91	DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

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NODE=M026R7
NODE=M026R7
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OCCUR=3
NODE=M026R;LINKAGE=E
NODE=M026R7;LINKAGE=BB

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NODE=M026R11;LINKAGE=AB

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NODE=M026R12;LINKAGE=E

NODE=M026R17
NODE=M026R17
OCCUR=2
NODE=M026R17;LINKAGE=E

$\Gamma(f_2(1270)\eta)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
<0.011	90	1 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

 $\Gamma(\omega\omega)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
<0.0031	90	1 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
<0.0063	90	1 ABLIKIM	05L	$BES2 \rightarrow \pi^+ \pi^- \pi^0 \pi^+ \pi^- \pi^0 \gamma$	
<0.0063	1	BISELLO	91	DM2 $\rightarrow \gamma \omega \omega$	

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

 $\Gamma(\omega\phi)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{14}/Γ
<0.0017	90	1 ABLIKIM	05L	$BES2 \rightarrow \pi^+ \pi^- \pi^0 K^+ K^- \gamma$	

¹ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

 $\Gamma(f_2(1270)f_2(1270))/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{15}/Γ
0.98 ± 0.25 OUR FIT					

$[(0.97 \pm 0.25) \times 10^{-2}$ OUR 2012 FIT]

0.76 ^{+0.25} _{-0.29} ± 0.17	91.2 ± 19.8	1 ABLIKIM	04M BES	$J/\psi \rightarrow \gamma 2\pi^+ 2\pi^-$	Γ_{15}/Γ
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¹ ABLIKIM 04M reports $[\Gamma(\eta_c(1S) \rightarrow f_2(1270)f_2(1270))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (1.3 \pm 0.3)^{+0.3}_{-0.4} \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{17}/Γ
7.3 ± 0.5 OUR FIT					

$[(7.2 \pm 0.6) \times 10^{-2}$ OUR 2012 FIT]

6.5 ± 0.6 OUR AVERAGE

$[(6.1 \pm 0.8) \times 10^{-2}$ OUR 2012 AVERAGE]

6.3 ± 1.3 ± 0.6	55	1,2 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- \pi^0$	Γ_{17}/Γ
7.9 ± 1.4 ± 0.7	107	3,4 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K_S^0 K^\mp \pi^\pm$	
8.5 ± 1.8		5 AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$	
5.1 ± 2.1	0.6k	6 BAI	04 BES	$J/\psi \rightarrow \gamma K^\pm \pi^\mp K_S^0$	
6.90 ± 1.42 ± 1.32	33	6 BISELLO	91 DM2	$J/\psi \rightarrow \gamma K^+ K^- \pi^0$	
5.43 ± 0.94 ± 0.94	68	6 BISELLO	91 DM2	$J/\psi \rightarrow \gamma K^\pm \pi^\mp K_S^0$	
4.8 ± 1.7	95	6,7 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	
16.1 ^{+9.2} _{-7.3}		8,9 HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 10.7	90% CL	6,10 PARTRIDGE	80B CBAL	$J/\psi \rightarrow \eta_c \gamma$
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¹ ABLIKIM 12N quotes $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K^+ K^- \pi^0) = (4.54 \pm 0.76 \pm 0.48) \times 10^{-6}$ which we multiply by 6 to account for isospin symmetry.

² ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (27.24 \pm 4.56 \pm 2.88) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ ABLIKIM 12N quotes $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K_S^0 K^\mp \pi^\pm) = (11.35 \pm 1.25 \pm 1.50) \times 10^{-6}$ which we multiply by 3 to account for isospin symmetry.

⁴ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (34.05 \pm 3.75 \pm 4.50) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁵ Determined from the ratio of $B(B^\pm \rightarrow K^\pm \eta_c) B(\eta_c \rightarrow K\bar{K}\pi) = (7.4 \pm 0.5 \pm 0.7) \times 10^{-5}$ reported in AUBERT, B 04B and $B(B^\pm \rightarrow K^\pm \eta_c) = (8.7 \pm 1.5) \times 10^{-3}$ reported in AUBERT 06E.

NODE=M026R13

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NODE=M026R13;LINKAGE=E

NODE=M026R10

NODE=M026R10

NODE=M026R10;LINKAGE=E

NODE=M026R22

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NODE=M026R4

NEW

OCCUR=2

OCCUR=2

NODE=M026R4;LINKAGE=BL

NODE=M026R4;LINKAGE=CL

NODE=M026R4;LINKAGE=AB

⁶The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

⁷Average from $K^+K^-\pi^0$ and $K^\pm K_S^0\pi^\mp$ decay channels.

⁸ $K^\pm K_S^0\pi^\mp$ corrected to $K\bar{K}\pi$ by factor 3. KS, MR.

⁹Estimated using $B(\psi(2S) \rightarrow \gamma\eta_c(1S)) = 0.0028 \pm 0.0006$.

¹⁰ $K^+K^-\pi^0$ corrected to $K\bar{K}\pi$ by factor 6. KS, MR

$\Gamma(\phi K^+K^-)/\Gamma(K\bar{K}\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_{17}
0.052^{+0.016}_{-0.014} ± 0.014	7	1 HUANG	03	BELL $B^\pm \rightarrow K^\pm\phi\phi$	

¹Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{18}/Γ
1.7±0.5 OUR AVERAGE	[0.047 ± 0.015 OUR 2012 AVERAGE]				

1.7±0.4±0.1	33	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma\eta\pi^+\pi^-$	
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• • • We do not use the following data for averages, fits, limits, etc. • • •

5.4±2.0	75	2 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c\gamma$	
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3.7±1.3±2.0	18	2 PARTRIDGE	80B CBAL	$J/\psi \rightarrow \eta\pi^+\pi^-\gamma$	
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¹ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (7.22 \pm 1.47 \pm 1.11) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

²The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

$\Gamma(\eta 2(\pi^+\pi^-))/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{19}/Γ
4.4±1.2±0.4	39	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma\eta 2(\pi^+\pi^-)$	

¹ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \eta 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (19.17 \pm 3.77 \pm 3.72) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+K^-\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{20}/Γ
6.9± 1.1 OUR FIT	[0.0061 ± 0.0012 OUR 2012 FIT]				

11.2± 1.9 OUR AVERAGE	[0.0142 ± 0.0033 OUR 2012 AVERAGE]				
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9.7± 2.2±0.9	38	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0\gamma K^+K^-\pi^+\pi^-$	
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12 ± 4	0.4k	2 BAI	04	BES $J/\psi \rightarrow \gamma K^+K^-\pi^+\pi^-$	
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21 ± 7	110	2 BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c\gamma$	
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14 ± 22	3 HIMEL	80B MRK2		$\psi(2S) \rightarrow \eta_c\gamma$	
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¹ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^+K^-\pi^+\pi^-)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (4.16 \pm 0.76 \pm 0.59) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

²The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

³Estimated using $B(\psi(2S) \rightarrow \gamma\eta_c(1S)) = 0.0028 \pm 0.0006$.

$\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\bar{K}\pi)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{21}/Γ_{17}
0.477±0.017±0.070	11k	1 DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$	

¹We have multiplied the value of $\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K_S^0 K^\pm\pi^\mp)$ reported in DEL-AMO-SANCHEZ 11M by a factor 1/3 to obtain $\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma(K\bar{K}\pi)$. Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

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NODE=M026R05
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NODE=M026R5
NODE=M026R5

NEW

NEW

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NODE=M026R5;LINKAGE=E

NODE=M026R5;LINKAGE=A

NODE=M026R01
NODE=M026R01

NODE=M026R01;LINKAGE=DE

$\Gamma(K^0 K^- \pi^+ \pi^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{22}/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
5.6±1.4±0.5	43	1,2 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K_S^0 K^- \pi^+ \pi^- 2\pi^0$	
1 ABLIKIM 12N quotes $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K_S^0 K^- \pi^+ \pi^- 2\pi^0)$ = $(12.01 \pm 2.22 \pm 2.04) \times 10^{-6}$ which we multiply by 2 to take c.c. into account.					
2 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^0 K^- \pi^+ \pi^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (24.02 \pm 4.44 \pm 4.08) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$					Γ_{23}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
7.5±2.4 OUR AVERAGE					
$[(71 \pm 29) \times 10^{-4}$ OUR 2012 AVERAGE]					
8 ± 4 ± 1	10	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma K^+ K^- 2(\pi^+ \pi^-)$	
7.1±2.3±1.6	100	2 ABLIKIM	06A BES2	$J/\psi \rightarrow K^+ K^- 2(\pi^+ \pi^-) \gamma$	
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (3.60 \pm 1.71 \pm 0.64) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
2 ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (1.21 \pm 0.32 \pm 0.24) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(2(K^+ K^-))/\Gamma_{\text{total}}$					Γ_{24}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.47±0.31 OUR FIT					
$[(1.34 \pm 0.32) \times 10^{-3}$ OUR 2012 FIT]					
2.2 ± 0.9 OUR AVERAGE	[0.0015 ± 0.0007 OUR 2011 AVERAGE]				
2.2 ± 0.9 ± 0.2	7	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma 2(K^+ K^-)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.4 ± 0.5 ± 0.6	14.5 ± 4.6	2 HUANG	03 BELL	$B^+ \rightarrow 2(K^+ K^-) K^+$	
21 ± 10 ± 6		3 ALBRECHT	94H ARG	$\gamma \gamma \rightarrow K^+ K^- K^+ K^-$	
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(K^+ K^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (0.94 \pm 0.37 \pm 0.14) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
2 Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12 \pm 0.10) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K \bar{K} \pi) = (5.5 \pm 1.7) \times 10^{-2}$.					
3 Normalized to the sum of $B(\eta_c \rightarrow K^\pm K_S^0 \pi^\mp)$, $B(\eta_c \rightarrow \phi \phi)$, $B(\eta_c \rightarrow K^+ K^- \pi^+ \pi^-)$, and $B(\eta_c \rightarrow 2\pi^+ 2\pi^-)$.					

$\Gamma(2(K^+ K^-))/\Gamma(K \bar{K} \pi)$					Γ_{24}/Γ_{17}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.020±0.004 OUR FIT					
$[(0.019 \pm 0.004)$ OUR 2012 FIT]					
0.024±0.007 OUR AVERAGE					
0.023±0.007±0.006		AUBERT,B	04B BABR	$B^\pm \rightarrow K^\pm \eta_c$	
0.026±0.009±0.007	15	1 HUANG	03 BELL	$B^\pm \rightarrow K^\pm (2K^+ 2K^-)$	
1 Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12 \pm 0.10) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K \bar{K} \pi) = (5.5 \pm 1.7) \times 10^{-2}$.					

$\Gamma(\pi^+ \pi^- \pi^0 \pi^0)/\Gamma_{\text{total}}$					Γ_{25}/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.7±0.9±0.4	118	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma \pi^+ \pi^- 2\pi^0$	
1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+ \pi^- \pi^0 \pi^0)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (20.31 \pm 2.20 \pm 3.33) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M026R06
NODE=M026R06

NODE=M026R06;LINKAGE=AA

NODE=M026R06;LINKAGE=AB

NODE=M026R23
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NODE=M026R20;LINKAGE=BB

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NODE=M026R38
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NEW

NODE=M026R38;LINKAGE=BB

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NODE=M026R07

NODE=M026R07;LINKAGE=AB

$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$					Γ_{26}/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
0.97 ± 0.12 OUR FIT [(0.86 ± 0.13) × 10^{-2} OUR 2012 FIT]					

1.35 ± 0.21 OUR AVERAGE
[(1.15 ± 0.26) × 10^{-2} OUR 2012 AVERAGE]

1.74 ± 0.32 ± 0.15	100	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma 2(\pi^+ \pi^-)$	
1.0 ± 0.5	542 ± 75	² BAI	04 BES	$J/\psi \rightarrow \gamma 2(\pi^+ \pi^-)$	
1.05 ± 0.17 ± 0.34	137	² BISELLO	91 DM2	$J/\psi \rightarrow \gamma 2\pi^+ 2\pi^-$	
1.3 ± 0.6	25	² BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	
2.0 ± 1.5 -1.0		³ HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$	

1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (7.51 \pm 0.85 \pm 1.11) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

2 The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

3 Estimated using $B(\psi(2S) \rightarrow \gamma \eta_c(1S)) = 0.0028 \pm 0.0006$.

$\Gamma(2(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}}$					Γ_{27}/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
17.4 ± 2.9 ± 1.5	175	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma 2(\pi^+ \pi^- 2\pi^0)$	

1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 2(\pi^+ \pi^- \pi^0))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (75.13 \pm 7.42 \pm 9.99) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$					Γ_{28}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
17 ± 4 OUR AVERAGE [(150 ± 50) × 10^{-4} OUR 2012 AVERAGE]					

20 ± 5 ± 2	51	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma 3(\pi^+ \pi^-)$	
15.2 ± 3.3 ± 3.5	479	² ABLIKIM	06A BES2	$J/\psi \rightarrow 3(\pi^+ \pi^-)\gamma$	

1 ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (8.82 \pm 1.57 \pm 1.59) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

2 ABLIKIM 06A reports $[\Gamma(\eta_c(1S) \rightarrow 3(\pi^+ \pi^-))/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma \eta_c(1S))] = (2.59 \pm 0.32 \pm 0.47) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$					Γ_{29}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
15.1 ± 1.6 OUR FIT [(14.1 ± 1.7) × 10^{-4} OUR 2012 FIT]					

13.2 ± 2.7 OUR AVERAGE [(12.5 ± 3.2) × 10^{-4} OUR 2012 AVERAGE]					
15 ± 5 ± 1	15	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma p\bar{p}$	
15 ± 6	213 ± 33	² BAI	04 BES	$J/\psi \rightarrow \gamma p\bar{p}$	
10 ± 3 ± 4	18	² BISELLO	91 DM2	$J/\psi \rightarrow \gamma p\bar{p}$	
11 ± 6	23	² BALTRUSAIT..86	MRK3	$J/\psi \rightarrow \eta_c \gamma$	
29 ± 29 -15		³ HIMEL	80B MRK2	$\psi(2S) \rightarrow \eta_c \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

14.8 ± 2.0 ± 1.7 -2.4 -1.8	195	⁴ WU	06 BELL	$B^+ \rightarrow p\bar{p} K^+$	
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NODE=M026R1

NODE=M026R1

NEW

NEW

NODE=M026R1;LINKAGE=AB

NODE=M026R1;LINKAGE=E

NODE=M026R1;LINKAGE=A

NODE=M026R08

NODE=M026R08

NODE=M026R08;LINKAGE=AB

NODE=M026R24

NODE=M026R24

NEW

NODE=M026R24;LINKAGE=AL

NODE=M026R24;LINKAGE=AB

NODE=M026R2

NODE=M026R2

NEW

NEW

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (0.65 \pm 0.19 \pm 0.10) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$. Where relevant, the error in this branching ratio is treated as a common systematic in computing averages.

³ Estimated using $B(\psi(2S) \rightarrow \gamma\eta_c(1S)) = 0.0028 \pm 0.0006$.

⁴ WU 06 reports $[\Gamma(\eta_c(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (1.42 \pm 0.11^{+0.16}_{-0.20}) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p})/\Gamma(K\bar{K}\pi)$		Γ_{29}/Γ_{17}		
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0206 ± 0.0021 OUR FIT				
[0.0197 ± 0.0022 OUR 2012 FIT]				

0.021 ± 0.002 ± 0.004 195 ¹ WU 06 BELL $B^\pm \rightarrow K^\pm p\bar{p}$

¹ Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\phi\phi)/\Gamma_{\text{total}}$		$\Gamma_{29}/\Gamma \times \Gamma_7/\Gamma$		
VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT	
0.27 ± 0.05 OUR FIT	[(0.27 ± 0.06) × 10 ⁻⁵ OUR 2012 FIT]			
4.0 ± 3.5	BAGLIN	89	SPEC	$\bar{p}p \rightarrow K^+ K^- K^+ K^-$

$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$		Γ_{30}/Γ		
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.36 ± 0.13 ± 0.03	14	¹ ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma p\bar{p}\pi^0$
				¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (1.53 \pm 0.49 \pm 0.23) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$		Γ_{31}/Γ			
VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
10.8 ± 2.4 OUR FIT					
11.6 ± 3.5 OUR AVERAGE	[(10.4 ± 3.1) × 10 ⁻⁴ OUR 2011 AVERAGE]				
11.6 ± 2.2 ± 2.6		¹ ABLIKIM	12B BES3		

• • • We do not use the following data for averages, fits, limits, etc. • • •

9.9 ^{+2.7} _{-2.6} ± 1.2	20	² WU	06	BELL	$B^+ \rightarrow \Lambda\bar{\Lambda}K^+$
<20	90	³ BISELLO	91	DM2	$e^+ e^- \rightarrow \gamma\Lambda\bar{\Lambda}$

¹ ABLIKIM 12B reports $[\Gamma(\eta_c(1S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (0.198 \pm 0.021 \pm 0.032) \times 10^{-4}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² WU 06 reports $[\Gamma(\eta_c(1S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (0.95^{+0.25+0.08}_{-0.22-0.11}) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

$\Gamma(\Lambda\bar{\Lambda})/\Gamma(p\bar{p})$		Γ_{31}/Γ_{29}		
VALUE	DOCUMENT ID	TECN	COMMENT	
0.72 ± 0.16 OUR FIT				
0.67^{+0.19}_{-0.16} ± 0.12	¹ WU	06	BELL	$B^+ \rightarrow p\bar{p}K^+, \Lambda\bar{\Lambda}K^+$

¹ Not independent from other $\eta_c \rightarrow \Lambda\bar{\Lambda}$, $p\bar{p}$ branching ratios reported by WU 06.

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NODE=M026R2;LINKAGE=E

NODE=M026R2;LINKAGE=A

NODE=M026R2;LINKAGE=WU

NODE=M026R03
NODE=M026R03
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NODE=M026R09;LINKAGE=AB

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NODE=M026R18;LINKAGE=AB

NODE=M026R18;LINKAGE=WU

NODE=M026R18;LINKAGE=E

NODE=M026R27
NODE=M026R27

NODE=M026R27;LINKAGE=WU

$\Gamma(K\bar{K}\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{32}/Γ
1.0±0.5±0.1		7	1,2 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma \eta K^+ K^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<3.1 90 3 BALTRUSAIT..86 MRK3 $J/\psi \rightarrow \eta_c \gamma$

¹ ABLIKIM 12N quotes $B(\psi(2S) \rightarrow \pi^0 h_c) \cdot B(h_c \rightarrow \gamma \eta_c) \cdot B(\eta_c \rightarrow K^+ K^- \eta) = (12.01 \pm 2.22 \pm 2.04) \times 10^{-6}$ which we multiply by 2 to account for isospin symmetry.

² ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow K\bar{K}\eta)/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (4.22 \pm 2.02 \pm 0.64) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma \eta_c(1S)) = 0.0127 \pm 0.0036$.

 $\Gamma(\pi^+ \pi^- p\bar{p})/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{33}/Γ
5.3±1.7±0.5		19	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma p\bar{p} \pi^+ \pi^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<12 90 HIMEL 80B MRK2 $\psi(2S) \rightarrow \eta_c \gamma$

¹ ABLIKIM 12N reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+ \pi^- p\bar{p})/\Gamma_{\text{total}}] \times [\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}] = (2.30 \pm 0.65 \pm 0.36) \times 10^{-6}$ which we divide by our best value $\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}} = (4.3 \pm 0.4) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 RADIATIVE DECAYS

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{34}/Γ
1.57±0.12 OUR FIT						

$[(1.78 \pm 0.16) \times 10^{-4}$ OUR 2012 FIT]

1.9 +0.7 -0.6 OUR AVERAGE

$[(1.4 +0.7 -0.6) \times 10^{-4}$ OUR 2012 AVERAGE]

2.6 ±0.8 ±0.6 1 ABLIKIM 13I BES3

1.4 +0.7 -0.5 ±0.3 1.2 +2.8 -1.1 2 ADAMS 08 CLEO $\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.3 +1.0 -0.8 ±0.3 13 3 WICHT 08 BELL $B^\pm \rightarrow K^\pm \gamma\gamma$

2.80 +0.67 -0.58 ±1.0 4 ARMSTRONG 95F E760 $\bar{p}p \rightarrow \gamma\gamma$

< 9 90 5 BISELLO 91 DM2 $J/\psi \rightarrow \gamma\gamma\gamma$

6 +4 -3 ±4 4 BAGLIN 87B SPEC $\bar{p}p \rightarrow \gamma\gamma$

< 18 90 6 BLOOM 83 CBAL $J/\psi \rightarrow \eta_c \gamma$

¹ ABLIKIM 13I reports $[\Gamma(\eta_c(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (4.5 \pm 1.2 \pm 0.6) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² ADAMS 08 reports $[\Gamma(\eta_c(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))] = (2.4 +1.1 -0.8 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = (1.7 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

³ WICHT 08 reports $[\Gamma(\eta_c(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c K^+)] = (2.2 +0.9 +0.4 -0.7 -0.2) \times 10^{-7}$ which we divide by our best value $B(B^+ \rightarrow \eta_c K^+) = (9.6 \pm 1.1) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ Not independent from the values of the total and two-photon width quoted by the same experiment.

⁵ The quoted branching ratios use $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

⁶ Using $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 0.0127 \pm 0.0036$.

NODE=M026R15

NODE=M026R15

NODE=M026R15;LINKAGE=AK

NODE=M026R15;LINKAGE=AL

NODE=M026R15;LINKAGE=E

NODE=M026R3

NODE=M026R3

NODE=M026R3;LINKAGE=AB

NODE=M026310

NODE=M026R31

NODE=M026R31

NEW

NEW

NODE=M026R31;LINKAGE=AL

NODE=M026R31;LINKAGE=AD

NODE=M026R31;LINKAGE=WI

NODE=M026R31;LINKAGE=AB

NODE=M026R31;LINKAGE=E

NODE=M026R31;LINKAGE=C

$\Gamma(\gamma\gamma)/\Gamma(K\bar{K}\pi)$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{34}/Γ_{17}
2.14 ± 0.29 OUR FIT					
$[(2.5 \pm 0.4) \times 10^{-3}$ OUR 2012 FIT]					

3.2 +1.3 -1.0 +0.8 -0.6 13 1 WICHT 08 BELL $B^\pm \rightarrow K^\pm \gamma\gamma$

1 Using $B(B^+ \rightarrow \eta_c K^+) = (1.25 \pm 0.12^{+0.10}_{-0.12}) \times 10^{-3}$ from FANG 03 and $B(\eta_c \rightarrow K\bar{K}\pi) = (5.5 \pm 1.7) \times 10^{-2}$.

 $\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{29}/\Gamma \times \Gamma_{34}/\Gamma$
0.238 ± 0.024 OUR FIT					
$[(0.250 \pm 0.026) \times 10^{-6}$ OUR 2012 FIT]					

0.26 ± 0.05 OUR AVERAGE Error includes scale factor of 1.4.

$0.224^{+0.038}_{-0.037} \pm 0.020$	190	AMBROGIANI 03	E835	$\bar{p}p \rightarrow \eta_c \rightarrow \gamma\gamma$	
$0.336^{+0.080}_{-0.070}$		ARMSTRONG 95F	E760	$\bar{p}p \rightarrow \gamma\gamma$	
$0.68^{+0.42}_{-0.31}$	12	BAGLIN	87B SPEC	$\bar{p}p \rightarrow \gamma\gamma$	

Charge conjugation (C), Parity (P),
Lepton family number (LF) violating modes

NODE=M026R04

NODE=M026R04

NEW

NODE=M026R04;LINKAGE=BB

NODE=M026R32

NODE=M026R32

NEW

 $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{35}/Γ
<11	90	1 ABLIKIM	11G BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<60	90	2 ABLIKIM	06B BES2	$J/\psi \rightarrow \pi^+\pi^-\gamma$	
1 ABLIKIM 11G reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))]$					NODE=M026R34;LINKAGE=AL
$< 1.82 \times 10^{-6}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.					

2 ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))]$
 $< 1.1 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.

NODE=M026320

NODE=M026R34

NODE=M026R34

 $\Gamma(\pi^0\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{36}/Γ
< 3.5	90	1 ABLIKIM	11G BES3	$J/\psi \rightarrow \gamma\pi^0\pi^0$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<40	90	2 ABLIKIM	06B BES2	$J/\psi \rightarrow \pi^0\pi^0\gamma$	
1 ABLIKIM 11G reports $[\Gamma(\eta_c(1S) \rightarrow \pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))]$					NODE=M026R35;LINKAGE=AL
$< 6.0 \times 10^{-7}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.					

2 ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow \pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))]$
 $< 0.71 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.

NODE=M026R35

NODE=M026R35

NODE=M026R35;LINKAGE=AL

NODE=M026R35;LINKAGE=AB

 $\Gamma(K^+K^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{37}/Γ
<60	90	1 ABLIKIM	06B BES2	$J/\psi \rightarrow K^+K^-\gamma$	

1 ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow K^+K^-)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))]$
 $< 0.96 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.

NODE=M026R36

NODE=M026R36

NODE=M026R36;LINKAGE=AB

 $\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{38}/Γ
<31	90	1 ABLIKIM	06B BES2	$J/\psi \rightarrow K_S^0 K_S^0 \gamma$	

1 ABLIKIM 06B reports $[\Gamma(\eta_c(1S) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(J/\psi(1S) \rightarrow \gamma\eta_c(1S))]$
 $< 0.53 \times 10^{-5}$ which we divide by our best value $B(J/\psi(1S) \rightarrow \gamma\eta_c(1S)) = 1.7 \times 10^{-2}$.

NODE=M026R37

NODE=M026R37

NODE=M026R37;LINKAGE=AB

$\eta_c(1S)$ REFERENCES

NODE=M026

ABLIKIM	13I	PR D87 032003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54954
ABLIKIM	12B	PR D86 032008	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54267
ABLIKIM	12F	PRL 108 222002	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54271
ABLIKIM	12N	PR D86 092009	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54741
LIU	12B	PRL 108 232001	Z.Q. Liu <i>et al.</i>	(BELLE Collab.)	REFID=54303
ABLIKIM	11G	PR D84 032006	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53711
DEL-AMO-SA...	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=16751
VINOKUROVA	11	PL B706 139	A. Vinokurova <i>et al.</i>	(BELLE Collab.)	REFID=53927
LEES	10	PR D81 052010	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53236
MITCHELL	09	PRL 102 011801	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)	REFID=52676
ADAMS	08	PRL 101 101801	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=52261
AUBERT	08AB	PR D78 012006	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52267
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=52064
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)	REFID=52204
ABE	07	PRL 98 082001	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=51627
ABLIKIM	06A	PL B633 19	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50987
ABLIKIM	06B	EPJ C45 337	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50988
AUBERT	06E	PRL 96 052002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51059
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)	REFID=51004
WU	06	PRL 97 162003	C.-H. Wu <i>et al.</i>	(BELLE Collab.)	REFID=51472
ABLIKIM	05L	PR D72 072005	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50837
KUO	05	PL B621 41	C.C. Kuo <i>et al.</i>	(BELLE Collab.)	REFID=50801
ABE	04G	PR D70 071102	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=50182
ABLIKIM	04M	PR D70 112008	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50329
ASNER	04	PRL 92 142001	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=49745
AUBERT	04D	PRL 92 142002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=49746
AUBERT,B	04B	PR D70 011101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50043
BAI	04	PL B578 16	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49620
ABDALLAH	03J	EPJ C31 481	J. Abdallah <i>et al.</i>	(DELPHI Collab.)	REFID=49625
AMBROGIANI	03	PL B566 45	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=49465
BAI	03	PL B555 174	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49185
FANG	03	PRL 90 071801	F. Fang <i>et al.</i>	(BELLE Collab.)	REFID=49206
HUANG	03	PRC 91 241802	H.-C. Huang <i>et al.</i>	(BELLE Collab.)	REFID=49621
ABE,K	02	PRL 89 142001	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=49188
BAI	00F	PR D62 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=48546
BRANDENB...	00B	PRL 85 3095	G. Brandenburg <i>et al.</i>	(CLEO Collab.)	REFID=48553
ACCIARRI	99T	PL B461 155	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=47476
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47385
ABREU	98O	PL B441 479	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=46553
SHIRAI	98	PL B424 405	M. Shirai <i>et al.</i>	(AMY Collab.)	REFID=46381
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong <i>et al.</i>	(FNAL, FERM, GENO+)	REFID=44623
ALBRECHT	94H	PL B338 390	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=44098
ADRIANI	93N	PL B318 575	O. Adriani <i>et al.</i>	(L3 Collab.)	REFID=43670
BISELLO	91	NP B350 1	D. Bisello <i>et al.</i>	(DM2 Collab.)	REFID=41668
BAI	90B	PRL 65 1309	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41354
CHEN	90B	PL B243 169	W.Y. Chen <i>et al.</i>	(CLEO Collab.)	REFID=41360
BAGLIN	89	PL B231 557	C. Baglin, S. Baird, G. Bassompierre	(R704 Collab.)	REFID=41015
BEHREND	89	ZPHY C42 367	H.J. Behrend <i>et al.</i>	(CELLO Collab.)	REFID=40732
BRAUNSCH...	89	ZPHY C41 533	W. Braunschweig <i>et al.</i>	(TASSO Collab.)	REFID=40728
AIHARA	88D	PRC 60 2355	H. Aihara <i>et al.</i>	(TPC Collab.)	REFID=40588
BAGLIN	87B	PL B187 191	C. Baglin <i>et al.</i>	(R704 Collab.)	REFID=40018
BALTRUSAIT...	86	PR D33 629	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=22009
BERGER	86	PL 167B 120	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=22010
GAISER	86	PR D34 711	J. Gaiser <i>et al.</i>	(Crystal Ball Collab.)	REFID=22012
ALTHOFF	85B	ZPHY C29 189	M. Althoff <i>et al.</i>	(TASSO Collab.)	REFID=21349
BALTRUSAIT...	84	PRL 52 2126	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+) JP	REFID=22006
BLOOM	83	ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)	REFID=21682
HIMEL	80B	PRL 45 1146	T.M. Himel <i>et al.</i>	(SLAC, LBL, UCB)	REFID=22003
PARTRIDGE	80B	PRL 45 1150	R. Partridge <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=22004

NODE=M070

J/ψ(1S) $I^G(J^{PC}) = 0^-(1^- -)$ ***J/ψ(1S) MASS***

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3096.916±0.011 OUR AVERAGE				
3096.917±0.010±0.007		AULCHENKO 03	KEDR	$e^+ e^- \rightarrow$ hadrons
3096.89 ± 0.09	502	1 ARTAMONOV 00	OLYA	$e^+ e^- \rightarrow$ hadrons
3096.91 ± 0.03 ± 0.01		2 ARMSTRONG 93B	E760	$\bar{p}p \rightarrow e^+ e^-$
3096.95 ± 0.1 ± 0.3	193	BAGLIN 87	SPEC	$\bar{p}p \rightarrow e^+ e^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3097.5 ± 0.3		GRIBUSHIN 96	FMPS	$515 \pi^- Be \rightarrow 2\mu X$
3098.4 ± 2.0	38k	LEMOIGNE 82	GOLI	$185 \pi^- Be \rightarrow \gamma\mu^+\mu^- A$
3096.93 ± 0.09	502	3 ZHOLENTZ 80	REDE	$e^+ e^-$
3097.0 ± 1		4 BRANDELIK 79C	DASP	$e^+ e^-$

¹ Reanalysis of ZHOLENTZ 80 using new electron mass (COHEN 87) and radiative corrections (KURAEV 85).

² Mass central value and systematic error recalculated by us according to Eq. (16) in ARMSTRONG 93B, using the value for the $\psi(2S)$ mass from AULCHENKO 03.

³ Superseded by ARTAMONOV 00.

⁴ From a simultaneous fit to $e^+ e^-$, $\mu^+ \mu^-$ and hadronic channels assuming $\Gamma(e^+ e^-) = \Gamma(\mu^+ \mu^-)$.

NODE=M070M

NODE=M070M

NODE=M070M;LINKAGE=AR

NODE=M070M;LINKAGE=NW

NODE=M070M;LINKAGE=RZ

NODE=M070M;LINKAGE=F

J/ψ(1S) WIDTH

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
92.9± 2.8 OUR AVERAGE Error includes scale factor of 1.1.				
96.1± 3.2	13k	1 ADAMS 06A	CLEO	$e^+ e^- \rightarrow \mu^+ \mu^- \gamma$
84.4± 8.9		BAI 95B	BES	$e^+ e^-$
91 ± 11 ± 6		2 ARMSTRONG 93B	E760	$\bar{p}p \rightarrow e^+ e^-$
85.5 ± 6.1 5.8		3 HSUEH 92	RVUE	See γ mini-review
• • • We do not use the following data for averages, fits, limits, etc. • • •				
94.1± 2.7		4 ANASHIN 10	KEDR	$3.097 e^+ e^- \rightarrow e^+ e^-$, $\mu^+ \mu^-$
93.7± 3.5	7.8k	1 AUBERT 04	BABR	$e^+ e^- \rightarrow \mu^+ \mu^- \gamma$
¹ Calculated by us from the reported values of $\Gamma(e^+ e^-) \times B(\mu^+ \mu^-)$ using $B(e^+ e^-) = (5.94 \pm 0.06)\%$ and $B(\mu^+ \mu^-) = (5.93 \pm 0.06)\%$.				
² The initial-state radiation correction reevaluated by ANDREOTTI 07 in its Ref. [4].				
³ Using data from COFFMAN 92, BALDINI-CELIO 75, BOYARSKI 75, ESPOSITO 75B, BRANDELIK 79C.				
⁴ Assuming $\Gamma(e^+ e^-) = \Gamma(\mu^+ \mu^-)$ and using $\Gamma(e^+ e^-)/\Gamma_{\text{total}} = (5.94 \pm 0.06)\%$.				

NODE=M070W

NODE=M070W

NODE=M070W;LINKAGE=AA

NODE=M070W;LINKAGE=AN

NODE=M070W;LINKAGE=A

NODE=M070W;LINKAGE=AS

NODE=M070215;NODE=M070

J/ψ(1S) DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 hadrons	(87.7 ± 0.5) %	
Γ_2 virtual $\gamma \rightarrow$ hadrons	(13.50 ± 0.30) %	
Γ_3 ggg	(64.1 ± 1.0) %	
Γ_4 γgg	(8.8 ± 1.1) %	
Γ_5 $e^+ e^-$	(5.94 ± 0.06) %	
Γ_6 $e^+ e^- \gamma$	[a] (8.8 ± 1.4) × 10 ⁻³	
Γ_7 $\mu^+ \mu^-$	(5.93 ± 0.06) %	

DESIG=3

DESIG=4

DESIG=249

DESIG=250

DESIG=1

DESIG=5

DESIG=2

Decays involving hadronic resonances

Γ_8	$\rho\pi$	(1.69 \pm 0.15) %	S=2.4	NODE=M070;CLUMP=A
Γ_9	$\rho^0\pi^0$	(5.6 \pm 0.7) \times 10 ⁻³		DESIG=20
Γ_{10}	$a_2(1320)\rho$	(1.09 \pm 0.22) %		DESIG=21
Γ_{11}	$\omega\pi^+\pi^+\pi^-\pi^-$	(8.5 \pm 3.4) \times 10 ⁻³		DESIG=43
Γ_{12}	$\omega\pi^+\pi^-\pi^0$	(4.0 \pm 0.7) \times 10 ⁻³		DESIG=26
Γ_{13}	$\omega\pi^+\pi^-$	(8.6 \pm 0.7) \times 10 ⁻³	S=1.1	DESIG=211
Γ_{14}	$\omega f_2(1270)$	(4.3 \pm 0.6) \times 10 ⁻³		DESIG=24
Γ_{15}	$K^*(892)^0\bar{K}^*(892)^0$	(2.3 \pm 0.7) \times 10 ⁻⁴		DESIG=28
Γ_{16}	$K^*(892)^\pm\bar{K}^*(892)^\mp$	(1.00 \pm 0.22) \times 10 ⁻³		DESIG=46
Γ_{17}	$K^*(892)^\pm\bar{K}^*(800)^\mp$	(1.1 \pm 1.0) \times 10 ⁻³		DESIG=256
Γ_{18}	$\eta K^*(892)^0\bar{K}^*(892)^0$	(1.15 \pm 0.26) \times 10 ⁻³		DESIG=257
Γ_{19}	$K^*(892)^0\bar{K}_2^*(1430)^0 + \text{c.c.}$	(6.0 \pm 0.6) \times 10 ⁻³		DESIG=48
Γ_{20}	$K^*(892)^0\bar{K}_2^*(1770)^0 + \text{c.c.} \rightarrow K^*(892)^\pm K^- \pi^\mp + \text{c.c.}$	(6.9 \pm 0.9) \times 10 ⁻⁴		DESIG=235
Γ_{21}	$\omega K^*(892)\bar{K} + \text{c.c.}$	(6.1 \pm 0.9) \times 10 ⁻³		DESIG=102
Γ_{22}	$K^+\bar{K}^*(892)^- + \text{c.c.}$	(5.12 \pm 0.30) \times 10 ⁻³		DESIG=121
Γ_{23}	$K^+\bar{K}^*(892)^- + \text{c.c.} \rightarrow K^+K^-\pi^0$	(1.97 \pm 0.20) \times 10 ⁻³		DESIG=231
Γ_{24}	$K^+\bar{K}^*(892)^- + \text{c.c.} \rightarrow K^0K^\pm\pi^\mp$	(3.0 \pm 0.4) \times 10 ⁻³		DESIG=232
Γ_{25}	$K^0\bar{K}^*(892)^0 + \text{c.c.}$	(4.39 \pm 0.31) \times 10 ⁻³		DESIG=122
Γ_{26}	$K^0\bar{K}^*(892)^0 + \text{c.c.} \rightarrow K^0K^\pm\pi^\mp$	(3.2 \pm 0.4) \times 10 ⁻³		DESIG=233
Γ_{27}	$K_1(1400)^\pm K^\mp$	(3.8 \pm 1.4) \times 10 ⁻³		DESIG=132
Γ_{28}	$\bar{K}^*(892)^0 K^+ \pi^- + \text{c.c.}$	seen		DESIG=214
Γ_{29}	$\omega\pi^0\pi^0$	(3.4 \pm 0.8) \times 10 ⁻³		DESIG=140
Γ_{30}	$b_1(1235)^\pm\pi^\mp$	[b] (3.0 \pm 0.5) \times 10 ⁻³		DESIG=49
Γ_{31}	$\omega K^\pm K_S^0\pi^\mp$	[b] (3.4 \pm 0.5) \times 10 ⁻³		DESIG=101
Γ_{32}	$b_1(1235)^0\pi^0$	(2.3 \pm 0.6) \times 10 ⁻³		DESIG=160
Γ_{33}	$\eta K^\pm K_S^0\pi^\mp$	[b] (2.2 \pm 0.4) \times 10 ⁻³		DESIG=230
Γ_{34}	$\phi K^*(892)\bar{K} + \text{c.c.}$	(2.18 \pm 0.23) \times 10 ⁻³		DESIG=104
Γ_{35}	$\omega K\bar{K}$	(1.70 \pm 0.32) \times 10 ⁻³		DESIG=27
Γ_{36}	$\omega f_0(1710) \rightarrow \omega K\bar{K}$	(4.8 \pm 1.1) \times 10 ⁻⁴		DESIG=130
Γ_{37}	$\phi 2(\pi^+\pi^-)$	(1.66 \pm 0.23) \times 10 ⁻³		DESIG=35
Γ_{38}	$\Delta(1232)^{++}\bar{p}\pi^-$	(1.6 \pm 0.5) \times 10 ⁻³		DESIG=70
Γ_{39}	$\omega\eta$	(1.74 \pm 0.20) \times 10 ⁻³	S=1.6	DESIG=30
Γ_{40}	$\phi K\bar{K}$	(1.83 \pm 0.24) \times 10 ⁻³	S=1.5	DESIG=36
Γ_{41}	$\phi f_0(1710) \rightarrow \phi K\bar{K}$	(3.6 \pm 0.6) \times 10 ⁻⁴		DESIG=129
Γ_{42}	$\phi f_2(1270)$	(7.2 \pm 1.3) \times 10 ⁻⁴		DESIG=39
Γ_{43}	$\Delta(1232)^{++}\bar{\Delta}(1232)^{--}$	(1.10 \pm 0.29) \times 10 ⁻³		DESIG=66
Γ_{44}	$\Sigma(1385)^-\bar{\Sigma}(1385)^+(\text{or c.c.})$	[b] (1.10 \pm 0.12) \times 10 ⁻³		DESIG=67
Γ_{45}	$\phi f'_2(1525)$	(8 \pm 4) \times 10 ⁻⁴		DESIG=40
Γ_{46}	$\phi\pi^+\pi^-$	(9.4 \pm 0.9) \times 10 ⁻⁴	S=1.2	DESIG=34
Γ_{47}	$\phi\pi^0\pi^0$	(5.6 \pm 1.6) \times 10 ⁻⁴		DESIG=76
Γ_{48}	$\phi K^\pm K_S^0\pi^\mp$	[b] (7.2 \pm 0.8) \times 10 ⁻⁴		DESIG=103
Γ_{49}	$\omega f_1(1420)$	(6.8 \pm 2.4) \times 10 ⁻⁴		DESIG=105
Γ_{50}	$\phi\eta$	(7.5 \pm 0.8) \times 10 ⁻⁴	S=1.5	DESIG=37
Γ_{51}	$\Xi^0\bar{\Xi}^0$	(1.20 \pm 0.24) \times 10 ⁻³		DESIG=248
Γ_{52}	$\Xi(1530)^-\bar{\Xi}^+$	(5.9 \pm 1.5) \times 10 ⁻⁴		DESIG=107
Γ_{53}	$pK^-\bar{\Sigma}(1385)^0$	(5.1 \pm 3.2) \times 10 ⁻⁴		DESIG=74
Γ_{54}	$\omega\pi^0$	(4.5 \pm 0.5) \times 10 ⁻⁴	S=1.4	DESIG=32
Γ_{55}	$\phi\eta'(958)$	(4.0 \pm 0.7) \times 10 ⁻⁴	S=2.1	DESIG=38
Γ_{56}	$\phi f_0(980)$	(3.2 \pm 0.9) \times 10 ⁻⁴	S=1.9	DESIG=41
Γ_{57}	$\phi f_0(980) \rightarrow \phi\pi^+\pi^-$	(1.8 \pm 0.4) \times 10 ⁻⁴		DESIG=236
Γ_{58}	$\phi f_0(980) \rightarrow \phi\pi^0\pi^0$	(1.7 \pm 0.7) \times 10 ⁻⁴		DESIG=237
Γ_{59}	$\eta\phi f_0(980) \rightarrow \eta\phi\pi^+\pi^-$	(3.2 \pm 1.0) \times 10 ⁻⁴		DESIG=229
Γ_{60}	$\phi a_0(980)^0 \rightarrow \phi\eta\pi^0$	(5 \pm 4) \times 10 ⁻⁶		DESIG=258

Γ_{61}	$\Xi(1530)^0 \Xi^0$	(3.2 \pm 1.4) $\times 10^{-4}$	DESIG=108
Γ_{62}	$\Sigma(1385)^- \bar{\Sigma}^+$ (or c.c.)	[b] (3.1 \pm 0.5) $\times 10^{-4}$	DESIG=68
Γ_{63}	$\phi f_1(1285)$	(2.6 \pm 0.5) $\times 10^{-4}$	S=1.1 DESIG=106
Γ_{64}	$\eta \pi^+ \pi^-$	(4.0 \pm 1.7) $\times 10^{-4}$	DESIG=239
Γ_{65}	$\rho \eta$	(1.93 \pm 0.23) $\times 10^{-4}$	DESIG=22
Γ_{66}	$\omega \eta'(958)$	(1.82 \pm 0.21) $\times 10^{-4}$	DESIG=31
Γ_{67}	$\omega f_0(980)$	(1.4 \pm 0.5) $\times 10^{-4}$	DESIG=150
Γ_{68}	$\rho \eta'(958)$	(1.05 \pm 0.18) $\times 10^{-4}$	DESIG=23
Γ_{69}	$a_2(1320)^\pm \pi^\mp$	[b] < 4.3 $\times 10^{-3}$	CL=90% DESIG=42
Γ_{70}	$K\bar{K}_2^*(1430) +$ c.c.	< 4.0 $\times 10^{-3}$	CL=90% DESIG=45
Γ_{71}	$K_1(1270)^\pm K^\mp$	< 3.0 $\times 10^{-3}$	CL=90% DESIG=131
Γ_{72}	$K_2^*(1430)^0 \bar{K}_2^*(1430)^0$	< 2.9 $\times 10^{-3}$	CL=90% DESIG=47
Γ_{73}	$\phi \pi^0$	< 6.4 $\times 10^{-6}$	CL=90% DESIG=33
Γ_{74}	$\phi \eta(1405) \rightarrow \phi \eta \pi \pi$	< 2.5 $\times 10^{-4}$	CL=90% DESIG=128
Γ_{75}	$\omega f_2'(1525)$	< 2.2 $\times 10^{-4}$	CL=90% DESIG=29
Γ_{76}	$\eta \phi(2170) \rightarrow$ $\eta K^*(892)^0 \bar{K}^*(892)^0$	< 2.52 $\times 10^{-4}$	CL=90% DESIG=253
Γ_{77}	$\Sigma(1385)^0 \bar{\Lambda} +$ c.c.	< 8.2 $\times 10^{-6}$	CL=90% DESIG=111
Γ_{78}	$\Delta(1232)^+ \bar{p}$	< 1 $\times 10^{-4}$	CL=90% DESIG=112
Γ_{79}	$\Lambda(1520) \bar{\Lambda} +$ c.c. $\rightarrow \gamma \Lambda \bar{\Lambda}$	< 4.1 $\times 10^{-6}$	CL=90% DESIG=260
Γ_{80}	$\Theta(1540) \bar{\Theta}(1540) \rightarrow$ $K_S^0 p K^- \bar{n} +$ c.c.	< 1.1 $\times 10^{-5}$	CL=90% DESIG=205
Γ_{81}	$\Theta(1540) K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n}$	< 2.1 $\times 10^{-5}$	CL=90% DESIG=206
Γ_{82}	$\Theta(1540) K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n$	< 1.6 $\times 10^{-5}$	CL=90% DESIG=207
Γ_{83}	$\bar{\Theta}(1540) K^+ n \rightarrow K_S^0 \bar{p} K^+ n$	< 5.6 $\times 10^{-5}$	CL=90% DESIG=208
Γ_{84}	$\bar{\Theta}(1540) K_S^0 p \rightarrow K_S^0 p K^- \bar{n}$	< 1.1 $\times 10^{-5}$	CL=90% DESIG=209
Γ_{85}	$\Sigma^0 \bar{\Lambda}$	< 9 $\times 10^{-5}$	CL=90% DESIG=110

Decays into stable hadrons

Γ_{86}	$2(\pi^+ \pi^-) \pi^0$	(4.1 \pm 0.5) %	S=2.4 NODE=M070;CLUMP=B
Γ_{87}	$3(\pi^+ \pi^-) \pi^0$	(2.9 \pm 0.6) %	DESIG=9
Γ_{88}	$\pi^+ \pi^- \pi^0$	(2.11 \pm 0.07) %	DESIG=11
Γ_{89}	$\pi^+ \pi^- \pi^0 K^+ K^-$	(1.79 \pm 0.29) %	S=1.5 DESIG=7
Γ_{90}	$4(\pi^+ \pi^-) \pi^0$	(9.0 \pm 3.0) $\times 10^{-3}$	DESIG=18
Γ_{91}	$\pi^+ \pi^- K^+ K^-$	(6.6 \pm 0.5) $\times 10^{-3}$	DESIG=12
Γ_{92}	$\pi^+ \pi^- K^+ K^- \eta$	(1.84 \pm 0.28) $\times 10^{-3}$	DESIG=16
Γ_{93}	$\pi^0 \pi^0 K^+ K^-$	(2.45 \pm 0.31) $\times 10^{-3}$	DESIG=238
Γ_{94}	$K\bar{K}\pi$	(6.1 \pm 1.0) $\times 10^{-3}$	DESIG=234
Γ_{95}	$2(\pi^+ \pi^-)$	(3.57 \pm 0.30) $\times 10^{-3}$	DESIG=15
Γ_{96}	$3(\pi^+ \pi^-)$	(4.3 \pm 0.4) $\times 10^{-3}$	DESIG=8
Γ_{97}	$2(\pi^+ \pi^- \pi^0)$	(1.62 \pm 0.21) %	DESIG=10
Γ_{98}	$2(\pi^+ \pi^-) \eta$	(2.29 \pm 0.24) $\times 10^{-3}$	DESIG=210
Γ_{99}	$3(\pi^+ \pi^-) \eta$	(7.2 \pm 1.5) $\times 10^{-4}$	DESIG=201
Γ_{100}	$p\bar{p}$	(2.120 \pm 0.029) $\times 10^{-3}$	DESIG=202
Γ_{101}	$p\bar{p} \pi^0$	(1.19 \pm 0.08) $\times 10^{-3}$	DESIG=50
Γ_{102}	$p\bar{p} \pi^+ \pi^-$	(6.0 \pm 0.5) $\times 10^{-3}$	DESIG=52
Γ_{103}	$p\bar{p} \pi^+ \pi^- \pi^0$	[c] (2.3 \pm 0.9) $\times 10^{-3}$	S=1.3 DESIG=54
Γ_{104}	$p\bar{p} \eta$	(2.00 \pm 0.12) $\times 10^{-3}$	DESIG=55
Γ_{105}	$p\bar{p} \rho$	< 3.1 $\times 10^{-4}$	DESIG=56
Γ_{106}	$p\bar{p} \omega$	(1.10 \pm 0.15) $\times 10^{-3}$	DESIG=57
Γ_{107}	$p\bar{p} \eta'(958)$	(2.1 \pm 0.4) $\times 10^{-4}$	DESIG=58
Γ_{108}	$p\bar{p} \phi$	(4.5 \pm 1.5) $\times 10^{-5}$	DESIG=59
Γ_{109}	$n\bar{n}$	(2.09 \pm 0.16) $\times 10^{-3}$	DESIG=127
Γ_{110}	$n\bar{n} \pi^+ \pi^-$	(4 \pm 4) $\times 10^{-3}$	DESIG=64
Γ_{111}	$\Sigma^+ \bar{\Sigma}^-$	(1.50 \pm 0.24) $\times 10^{-3}$	DESIG=65
Γ_{112}	$\Sigma^0 \bar{\Sigma}^0$	(1.29 \pm 0.09) $\times 10^{-3}$	DESIG=247

Γ_{113}	$2(\pi^+\pi^-)K^+K^-$	(4.7 \pm 0.7) $\times 10^{-3}$	S=1.3	DESIG=17
Γ_{114}	$p\bar{n}\pi^-$	(2.12 \pm 0.09) $\times 10^{-3}$		DESIG=53
Γ_{115}	$nN(1440)$	seen		DESIG=215;OUR EST; \rightarrow UNCHECKED \leftarrow
Γ_{116}	$nN(1520)$	seen		DESIG=216;OUR EST; \rightarrow UNCHECKED \leftarrow
Γ_{117}	$nN(1535)$	seen		DESIG=217;OUR EST; \rightarrow UNCHECKED \leftarrow
Γ_{118}	$\Xi^-\Xi^+$	(8.6 \pm 1.1) $\times 10^{-4}$	S=1.2	DESIG=62
Γ_{119}	$\Lambda\bar{\Lambda}$	(1.61 \pm 0.15) $\times 10^{-3}$	S=1.9	DESIG=60
Γ_{120}	$\Lambda\bar{\Sigma}^-\pi^+$ (or c.c.)	[b] (8.3 \pm 0.7) $\times 10^{-4}$	S=1.2	DESIG=71
Γ_{121}	$pK^-\bar{\Lambda}$	(8.9 \pm 1.6) $\times 10^{-4}$		DESIG=72
Γ_{122}	$2(K^+K^-)$	(7.6 \pm 0.9) $\times 10^{-4}$		DESIG=19
Γ_{123}	$pK^-\bar{\Sigma}^0$	(2.9 \pm 0.8) $\times 10^{-4}$		DESIG=73
Γ_{124}	K^+K^-	(2.70 \pm 0.17) $\times 10^{-4}$		DESIG=13
Γ_{125}	$K_S^0 K_L^0$	(2.1 \pm 0.4) $\times 10^{-4}$	S=3.2	DESIG=75
Γ_{126}	$\Lambda\bar{\Lambda}\pi^+\pi^-$	(4.3 \pm 1.0) $\times 10^{-3}$		DESIG=261
Γ_{127}	$\Lambda\bar{\Lambda}\eta$	(1.62 \pm 0.17) $\times 10^{-4}$		DESIG=228
Γ_{128}	$\Lambda\bar{\Lambda}\pi^0$	(3.8 \pm 0.4) $\times 10^{-5}$		DESIG=109
Γ_{129}	$\bar{\Lambda}nK_S^0$ + c.c.	(6.5 \pm 1.1) $\times 10^{-4}$		DESIG=225
Γ_{130}	$\pi^+\pi^-$	(1.47 \pm 0.14) $\times 10^{-4}$		DESIG=6
Γ_{131}	$\Lambda\bar{\Sigma}^++$ c.c.	(2.83 \pm 0.23) $\times 10^{-3}$		DESIG=61
Γ_{132}	$K_S^0 K_S^0$	< 1 $\times 10^{-6}$	CL=95%	DESIG=14

Radiative decays

Γ_{133}	3γ	(1.16 \pm 0.22) $\times 10^{-5}$		NODE=M070;CLUMP=C
Γ_{134}	4γ	< 9 $\times 10^{-6}$	CL=90%	DESIG=81
Γ_{135}	5γ	< 1.5 $\times 10^{-5}$	CL=90%	DESIG=244
Γ_{136}	$\gamma\eta_c(1S)$	(1.7 \pm 0.4) %	S=1.6	DESIG=245
Γ_{137}	$\gamma\eta_c(1S) \rightarrow 3\gamma$	(3.8 \pm 1.3) $\times 10^{-6}$	S=1.1	DESIG=85
Γ_{138}	$\gamma\pi^+\pi^-2\pi^0$	(8.3 \pm 3.1) $\times 10^{-3}$		DESIG=246
Γ_{139}	$\gamma\eta\pi\pi$	(6.1 \pm 1.0) $\times 10^{-3}$		DESIG=99
Γ_{140}	$\gamma\eta_2(1870) \rightarrow \gamma\eta\pi^+\pi^-$	(6.2 \pm 2.4) $\times 10^{-4}$		DESIG=96
Γ_{141}	$\gamma\eta(1405/1475) \rightarrow \gamma K\bar{K}\pi$	[d] (2.8 \pm 0.6) $\times 10^{-3}$	S=1.6	DESIG=142
Γ_{142}	$\gamma\eta(1405/1475) \rightarrow \gamma\gamma\rho^0$	(7.8 \pm 2.0) $\times 10^{-5}$	S=1.8	DESIG=89
Γ_{143}	$\gamma\eta(1405/1475) \rightarrow \gamma\eta\pi^+\pi^-$	(3.0 \pm 0.5) $\times 10^{-4}$		DESIG=171
Γ_{144}	$\gamma\eta(1405/1475) \rightarrow \gamma\gamma\phi$	< 8.2 $\times 10^{-5}$	CL=95%	DESIG=170
Γ_{145}	$\gamma\rho\rho$	(4.5 \pm 0.8) $\times 10^{-3}$		DESIG=212
Γ_{146}	$\gamma\rho\omega$	< 5.4 $\times 10^{-4}$	CL=90%	DESIG=94
Γ_{147}	$\gamma\rho\phi$	< 8.8 $\times 10^{-5}$	CL=90%	DESIG=226
Γ_{148}	$\gamma\eta'(958)$	(5.16 \pm 0.14) $\times 10^{-3}$	S=1.1	DESIG=227
Γ_{149}	$\gamma 2\pi^+2\pi^-$	(2.8 \pm 0.5) $\times 10^{-3}$	S=1.9	DESIG=84
Γ_{150}	$\gamma f_2(1270)f_2(1270)$	(9.5 \pm 1.7) $\times 10^{-4}$		DESIG=95
Γ_{151}	$\gamma f_2(1270)f_2(1270)$ (non resonant)	(8.2 \pm 1.9) $\times 10^{-4}$		DESIG=203
Γ_{152}	$\gamma K^+K^-\pi^+\pi^-$	(2.1 \pm 0.6) $\times 10^{-3}$		DESIG=204
Γ_{153}	$\gamma f_4(2050)$	(2.7 \pm 0.7) $\times 10^{-3}$		DESIG=143
Γ_{154}	$\gamma\omega\omega$	(1.61 \pm 0.33) $\times 10^{-3}$		DESIG=100
Γ_{155}	$\gamma\eta(1405/1475) \rightarrow \gamma\rho^0\rho^0$	(1.7 \pm 0.4) $\times 10^{-3}$	S=1.3	DESIG=97
Γ_{156}	$\gamma f_2(1270)$	(1.43 \pm 0.11) $\times 10^{-3}$		DESIG=124
Γ_{157}	$\gamma f_0(1710) \rightarrow \gamma K\bar{K}$	(8.5 \pm 1.2) $\times 10^{-4}$	S=1.2	DESIG=86
Γ_{158}	$\gamma f_0(1710) \rightarrow \gamma\pi\pi$	(4.0 \pm 1.0) $\times 10^{-4}$		DESIG=91
Γ_{159}	$\gamma f_0(1710) \rightarrow \gamma\omega\omega$	(3.1 \pm 1.0) $\times 10^{-4}$		DESIG=135
Γ_{160}	$\gamma\eta$	(1.104 \pm 0.034) $\times 10^{-3}$		DESIG=221
Γ_{161}	$\gamma f_1(1420) \rightarrow \gamma K\bar{K}\pi$	(7.9 \pm 1.3) $\times 10^{-4}$		DESIG=83
Γ_{162}	$\gamma f_1(1285)$	(6.1 \pm 0.8) $\times 10^{-4}$		DESIG=175
Γ_{163}	$\gamma f_1(1510) \rightarrow \gamma\eta\pi^+\pi^-$	(4.5 \pm 1.2) $\times 10^{-4}$		DESIG=88
Γ_{164}	$\gamma f'_2(1525)$	(4.5 \pm 0.7) $\times 10^{-4}$		DESIG=141
Γ_{165}	$\gamma f_2(1640) \rightarrow \gamma\omega\omega$	(2.8 \pm 1.8) $\times 10^{-4}$		DESIG=87

Γ_{166}	$\gamma f_2(1910) \rightarrow \gamma\omega\omega$	(2.0 \pm 1.4) $\times 10^{-4}$	DESIG=223
Γ_{167}	$\gamma f_0(1800) \rightarrow \gamma\omega\phi$	(2.5 \pm 0.6) $\times 10^{-4}$	DESIG=262
Γ_{168}	$\gamma f_2(1950) \rightarrow \gamma K^*(892)\bar{K}^*(892)$	(7.0 \pm 2.2) $\times 10^{-4}$	DESIG=144
Γ_{169}	$\gamma K^*(892)\bar{K}^*(892)$	(4.0 \pm 1.3) $\times 10^{-3}$	DESIG=145
Γ_{170}	$\gamma\phi\phi$	(4.0 \pm 1.2) $\times 10^{-4}$	S=2.1 DESIG=98
Γ_{171}	$\gamma p\bar{p}$	(3.8 \pm 1.0) $\times 10^{-4}$	DESIG=90
Γ_{172}	$\gamma\eta(2225)$	(3.3 \pm 0.5) $\times 10^{-4}$	DESIG=126
Γ_{173}	$\gamma\eta(1760) \rightarrow \gamma\rho^0\rho^0$	(1.3 \pm 0.9) $\times 10^{-4}$	DESIG=125
Γ_{174}	$\gamma\eta(1760) \rightarrow \gamma\omega\omega$	(1.98 \pm 0.33) $\times 10^{-3}$	DESIG=224
Γ_{175}	$\gamma X(1835) \rightarrow \gamma\pi^+\pi^-\eta'$	(2.6 \pm 0.4) $\times 10^{-4}$	DESIG=213
Γ_{176}	$\gamma X(1835) \rightarrow \gamma p\bar{p}$	(7.7 \pm 1.5) $\times 10^{-5}$	DESIG=254
Γ_{177}	$\gamma(K\bar{K}\pi) [J^{PC} = 0^-]$	(7 \pm 4) $\times 10^{-4}$	S=2.1 DESIG=176
Γ_{178}	$\gamma\pi^0$	(3.49 \pm 0.33) $\times 10^{-5}$	DESIG=82
Γ_{179}	$\gamma p\bar{p}\pi^+\pi^-$	< 7.9 $\times 10^{-4}$	CL=90% DESIG=93
Γ_{180}	$\gamma\Lambda\bar{\Lambda}$	< 1.3 $\times 10^{-4}$	CL=90% DESIG=200
Γ_{181}	$\gamma f_0(2200)$		DESIG=123
Γ_{182}	$\gamma f_J(2220)$	> 2.50 $\times 10^{-3}$	CL=99.9% DESIG=92
Γ_{183}	$\gamma f_J(2220) \rightarrow \gamma\pi\pi$	(8 \pm 4) $\times 10^{-5}$	DESIG=136
Γ_{184}	$\gamma f_J(2220) \rightarrow \gamma K\bar{K}$	< 3.6 $\times 10^{-5}$	DESIG=137
Γ_{185}	$\gamma f_J(2220) \rightarrow \gamma p\bar{p}$	(1.5 \pm 0.8) $\times 10^{-5}$	DESIG=138
Γ_{186}	$\gamma f_0(1500)$	(1.01 \pm 0.32) $\times 10^{-4}$	DESIG=172
Γ_{187}	$\gamma A \rightarrow \gamma$ invisible	[e] < 6.3 $\times 10^{-6}$	CL=90% DESIG=251
Γ_{188}	$\gamma A^0 \rightarrow \gamma\mu^+\mu^-$	[f] < 2.1 $\times 10^{-5}$	CL=90% DESIG=259

Weak decays

Γ_{189}	$D^- e^+ \nu_e + \text{c.c.}$	< 1.2 $\times 10^{-5}$	CL=90% NODE=M070;CLUMP=E DESIG=218
Γ_{190}	$\bar{D}^0 e^+ e^- + \text{c.c.}$	< 1.1 $\times 10^{-5}$	CL=90% DESIG=219
Γ_{191}	$D_s^- e^+ \nu_e + \text{c.c.}$	< 3.6 $\times 10^{-5}$	CL=90% DESIG=220
Γ_{192}	$D^- \pi^+ + \text{c.c.}$	< 7.5 $\times 10^{-5}$	CL=90% DESIG=241
Γ_{193}	$\bar{D}^0 \bar{K}^0 + \text{c.c.}$	< 1.7 $\times 10^{-4}$	CL=90% DESIG=242
Γ_{194}	$D_s^- \pi^+ + \text{c.c.}$	< 1.3 $\times 10^{-4}$	CL=90% DESIG=243

Charge conjugation (C), Parity (P), Lepton Family number (LF) violating modes

Γ_{195}	$\gamma\gamma$	C < 5 $\times 10^{-6}$	CL=90% DESIG=80
Γ_{196}	$e^\pm \mu^\mp$	LF < 1.1 $\times 10^{-6}$	CL=90% DESIG=177
Γ_{197}	$e^\pm \tau^\mp$	LF < 8.3 $\times 10^{-6}$	CL=90% DESIG=178
Γ_{198}	$\mu^\pm \tau^\mp$	LF < 2.0 $\times 10^{-6}$	CL=90% DESIG=179

Other decays

Γ_{199}	invisible	< 7 $\times 10^{-4}$	CL=90% NODE=M070;CLUMP=F DESIG=240
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[a] For $E_\gamma > 100$ MeV.

[b] The value is for the sum of the charge states or particle/antiparticle states indicated.

[c] Includes $p\bar{p}\pi^+\pi^-\gamma$ and excludes $p\bar{p}\eta$, $p\bar{p}\omega$, $p\bar{p}\eta'$.[d] See the “Note on the $\eta(1405)$ ” in the $\eta(1405)$ Particle Listings.[e] For a narrow state A with mass less than 960 MeV.[f] For a narrow scalar or pseudoscalar A^0 with mass 0.21–3.0 GeV.**J/ ψ (1S) PARTIAL WIDTHS**

$\Gamma(\text{hadrons})$		DOCUMENT ID	TECN	COMMENT	Γ_1
<hr/>					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
74.1 \pm 8.1	BAI	95B	BES	$e^+ e^-$	
59 \pm 24	BALDINI...	75	FRAG	$e^+ e^-$	
59 \pm 14	BOYARSKI	75	MRK1	$e^+ e^-$	
50 \pm 25	ESPOSITO	75B	FRAM	$e^+ e^-$	

NODE=M070220

NODE=M070W3

NODE=M070W3

LINKAGE=EGM

LINKAGE=SG

LINKAGE=MF

LINKAGE=MG

LINKAGE=NSA

LINKAGE=NA0

$\Gamma(e^+e^-)$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
5.55±0.14±0.02 OUR EVALUATION				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.71±0.16	13k	¹ ADAMS	06A CLEO	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
5.57±0.19	7.8k	¹ AUBERT	04 BABR	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
5.14±0.39		BAI	95B BES	e^+e^-
5.36 ^{+0.29} -0.28		² HSUEH	92 RVUE	See γ mini-review
4.72±0.35		ALEXANDER	89 RVUE	See γ mini-review
4.4 ± 0.6		² BRANDELIK	79C DASP	e^+e^-
4.6 ± 0.8		³ BALDINI-...	75 FRAG	e^+e^-
4.8 ± 0.6		BOYARSKI	75 MRK1	e^+e^-
4.6 ± 1.0		ESPOSITO	75B FRAM	e^+e^-

¹ Calculated by us from the reported values of $\Gamma(e^+e^-) \times B(\mu^+\mu^-)$ using $B(\mu^+\mu^-) = (5.93 \pm 0.06)\%$.

² From a simultaneous fit to e^+e^- , $\mu^+\mu^-$, and hadronic channels assuming $\Gamma(e^+e^-) = \Gamma(\mu^+\mu^-)$.

³ Assuming equal partial widths for e^+e^- and $\mu^+\mu^-$.

 Γ_5

NODE=M070W1

NODE=M070W1

→ UNCHECKED ←

 $\Gamma(\mu^+\mu^-)$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
5.13±0.52	BAI	95B BES	e^+e^-
4.8 ± 0.6	BOYARSKI	75 MRK1	e^+e^-
5 ± 1	ESPOSITO	75B FRAM	e^+e^-

 Γ_7

NODE=M070W1;LINKAGE=AA

NODE=M070W1;LINKAGE=F

NODE=M070W1;LINKAGE=B

NODE=M070W2

NODE=M070W2

 $\Gamma(\gamma\gamma)$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<5.4	90	BRANDELIK	79C DASP	e^+e^-

 Γ_{195}

NODE=M070W70

NODE=M070W70

 $J/\psi(1S) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

This combination of a partial width with the partial width into e^+e^- and with the total width is obtained from the integrated cross section into channel i in the e^+e^- annihilation.

 $\Gamma_1\Gamma_5/\Gamma$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
4 ± 0.8	¹ BALDINI-...	75 FRAG	e^+e^-
3.9±0.8	¹ ESPOSITO	75B FRAM	e^+e^-

¹ Data redundant with branching ratios or partial widths above.

 $\Gamma(e^+e^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_5\Gamma_5/\Gamma$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
332.3± 6.4±4.8	ANASHIN	10 KEDR	$3.097 e^+e^- \rightarrow e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
350 ± 20	BRANDELIK	79C DASP	e^+e^-
320 ± 70	¹ BALDINI-...	75 FRAG	e^+e^-
340 ± 90	¹ ESPOSITO	75B FRAM	e^+e^-
360 ± 100	¹ FORD	75 SPEC	e^+e^-

NODE=M070G3;LINKAGE=S

NODE=M070G1

NODE=M070G1

¹ Data redundant with branching ratios or partial widths above.

 $\Gamma(\mu^+\mu^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_7\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
334 ± 5 OUR AVERAGE				
331.8± 5.2±6.3		ANASHIN	10 KEDR	$3.097 e^+e^- \rightarrow \mu^+\mu^-$
338.4± 5.8±7.1	13k	ADAMS	06A CLEO	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
330.1± 7.7±7.3	7.8k	AUBERT	04 BABR	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
510 ± 90		DASP	75 DASP	e^+e^-
380 ± 50		¹ ESPOSITO	75B FRAM	e^+e^-

NODE=M070G1;LINKAGE=S

NODE=M070G2

NODE=M070G2

¹ Data redundant with branching ratios or partial widths above.

NODE=M070G2;LINKAGE=S

$\Gamma(\omega\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{12}\Gamma_5/\Gamma$
<u>VALUE (10⁻² keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.2±0.3±0.2	170	AUBERT	06D BABR	$10.6 e^+e^- \rightarrow \omega\pi^+\pi^-\pi^0\gamma$	

NODE=M070G8
NODE=M070G8

$\Gamma(\omega\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{13}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
53.6±5.0±0.4	788	1 AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$	

¹ AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \omega\pi^+\pi^-) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+\pi^-\pi^0)] = 47.8 \pm 3.1 \pm 3.2 \text{ eV}$ which we divide by our best value $B(\omega(782) \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^0\bar{K}_2^*(1430)^0 + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{19}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
33±4±1	317 ± 23	1,2 AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$	

NODE=M070G02
NODE=M070G02

¹ Dividing by 2/3 to take into account that $B(K^{*0} \rightarrow K^+\pi^-) = 2/3$.
² AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow K^*(892)^0\bar{K}_2^*(1430)^0 + \text{c.c.}) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(K_2^*(1430) \rightarrow K\pi)] = 16.4 \pm 1.1 \pm 1.4 \text{ eV}$ which we divide by our best value $B(K_2^*(1430) \rightarrow K\pi) = (49.9 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^*(892)^0\bar{K}_2(1770)^0 + \text{c.c.} \rightarrow K^*(892)^0K^-\pi^+ + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{20}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.8±0.4±0.3	110 ± 14	1 AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$	

NODE=M070G02;LINKAGE=AE
NODE=M070G02;LINKAGE=UB

¹ Dividing by 2/3 to take into account that $B(K^{*0} \rightarrow K^+\pi^-) = 2/3$.

$\Gamma(K^+\bar{K}^*(892)^- + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{22}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
29.0±1.7±1.3		AUBERT	08S BABR	$10.6 e^+e^- \rightarrow K^+K^*(892)^-\gamma$	

NODE=M070G03
NODE=M070G03

$\Gamma(K^+\bar{K}^*(892)^- + \text{c.c.} \rightarrow K^+K^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{23}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
10.96±0.85±0.70	155	AUBERT	08S BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^0\gamma$	

NODE=M070G20
NODE=M070G20

$\Gamma(K^+\bar{K}^*(892)^- + \text{c.c.} \rightarrow K^0K^\pm\pi^\mp) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{24}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
16.76±1.70±1.00	89	AUBERT	08S BABR	$10.6 e^+e^- \rightarrow K_S^0K^\pm\pi^\mp\gamma$	

NODE=M070G21
NODE=M070G21

$\Gamma(K^0\bar{K}^*(892)^0 + \text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{25}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
26.6±2.5±1.5		AUBERT	08S BABR	$10.6 e^+e^- \rightarrow K^0\bar{K}^*(892)^0\gamma$	

NODE=M070G19
NODE=M070G19

$\Gamma(K^0\bar{K}^*(892)^0 + \text{c.c.} \rightarrow K^0K^\pm\pi^\mp) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{26}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
17.70±1.70±1.00	94	AUBERT	08S BABR	$10.6 e^+e^- \rightarrow K_S^0K^\pm\pi^\mp\gamma$	

NODE=M070G22
NODE=M070G22

$\Gamma(\omega K\bar{K}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{35}\Gamma_5/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.70±1.98±0.03	24	1 AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \omega K^+K^-\gamma$	

NODE=M070G29
NODE=M070G29

¹ AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \omega K\bar{K}) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+\pi^-\pi^0)] = 3.3 \pm 1.3 \pm 1.2 \text{ eV}$ which we divide by our best value $B(\omega(782) \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\phi 2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{37}\Gamma_5/\Gamma$
<u>VALUE (10⁻² keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.96±0.19±0.01	35	1 AUBERT	06D BABR	$10.6 e^+e^- \rightarrow \phi 2(\pi^+\pi^-)\gamma$	

NODE=M070G10
NODE=M070G10

¹ AUBERT 06D reports $[\Gamma(J/\psi(1S) \rightarrow \phi 2(\pi^+\pi^-)) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)] = (0.47 \pm 0.09 \pm 0.03) \times 10^{-2} \text{ keV}$ which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M070G10;LINKAGE=AU

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{46}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
4.8 ± 0.4 OUR AVERAGE				
4.52 ± 0.48 ± 0.04	254 ± 23	1 SHEN	09 BELL	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$

- 1 SHEN 09 reports $4.50 \pm 0.41 \pm 0.26$ eV from a measurement of $[\Gamma(J/\psi(1S) \rightarrow \phi\pi^+\pi^-) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)]$ assuming $B(\phi(1020) \rightarrow K^+K^-) = (49.2 \pm 0.6) \times 10^{-2}$, which we rescale to our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- 2 AUBERT,BE 06D reports $[\Gamma(J/\psi(1S) \rightarrow \phi\pi^+\pi^-) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)] = 2.61 \pm 0.30 \pm 0.18$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\phi\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{47}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
3.15 ± 0.88 ± 0.03	23	1 AUBERT,BE	06D BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^0\pi^0\gamma$

1 AUBERT,BE 06D reports $[\Gamma(J/\psi(1S) \rightarrow \phi\pi^0\pi^0) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)] = 1.54 \pm 0.40 \pm 0.16$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\phi\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{50}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
6.1 ± 2.7 ± 0.4	6	1 AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \phi\eta\gamma$

1 AUBERT 07AU quotes $\Gamma_{ee}^{J/\psi} \cdot B(J/\psi \rightarrow \phi\eta) \cdot B(\phi \rightarrow K^+K^-) \cdot B(\eta \rightarrow 3\pi) = 0.84 \pm 0.37 \pm 0.05$ eV.

 $\Gamma(\phi f_0(980) \rightarrow \phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{57}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.21 ± 0.23 OUR AVERAGE				Error includes scale factor of 1.2.

1.48 ± 0.27 ± 0.09 60 ± 11 1 SHEN 09 BELL $10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$

1.02 ± 0.24 ± 0.01 20 ± 5 2 AUBERT 07AK BABR $10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

1 Multiplied by 2/3 to take into account the $\phi\pi^+\pi^-$ mode only. Using $B(\phi \rightarrow K^+K^-) = (49.2 \pm 0.6)\%$.

2 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \phi f_0(980) \rightarrow \phi\pi^+\pi^-) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)] = 0.50 \pm 0.11 \pm 0.04$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\phi f_0(980) \rightarrow \phi\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{58}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.96 ± 0.40 ± 0.01	7.0 ± 2.8	1 AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \pi^0\pi^0K^+K^-\gamma$

1 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \phi f_0(980) \rightarrow \phi\pi^0\pi^0) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)] = 0.47 \pm 0.19 \pm 0.05$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\eta\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{64}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
2.23 ± 0.97 ± 0.03	9	1 AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \eta\pi^+\pi^-\gamma$

1 AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \eta\pi^+\pi^-) \times \Gamma(J/\psi(1S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow \pi^+\pi^-\pi^0)] = 0.51 \pm 0.22 \pm 0.03$ eV which we divide by our best value $B(\eta \rightarrow \pi^+\pi^-\pi^0) = (22.92 \pm 0.28) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^*(892)^0\bar{K}^*(892)^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$
 $\Gamma_{15}\Gamma_5/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.28 ± 0.40 ± 0.11	25 ± 8	1 AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

1 Dividing by $(2/3)^2$ to take twice into account that $B(K^{*0} \rightarrow K^+\pi^-) = 2/3$.

NODE=M070G14

NODE=M070G14

NODE=M070G14;LINKAGE=SH

NODE=M070G14;LINKAGE=AU

NODE=M070G15

NODE=M070G15

NODE=M070G15;LINKAGE=AU

NODE=M070G28

NODE=M070G28

NODE=M070G05;LINKAGE=SH

NODE=M070G05;LINKAGE=UB

NODE=M070G06

NODE=M070G06

NODE=M070G06;LINKAGE=UB

NODE=M070G25

NODE=M070G25

NODE=M070G25;LINKAGE=AU

NODE=M070G01

NODE=M070G01

NODE=M070G01;LINKAGE=AE

$\Gamma(\phi f_2(1270)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{42}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
4.0±0.7±0.1	44 ± 7	1.2 AUBERT	07AK BABR	10.6 $e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$	
1 Using $B(\phi \rightarrow (K+K)^-) = (49.3 \pm 0.6)\%$.					
2 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \phi f_2(1270)) \times \Gamma(J/\psi(1S) \rightarrow e^+ e^-)/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] = 3.41 \pm 0.55 \pm 0.28$ eV which we divide by our best value $B(f_2(1270) \rightarrow \pi\pi) = (84.8^{+2.4}_{-1.2}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(2(\pi^+ \pi^-) \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{86}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
303±5±18	4990	AUBERT	07AU BABR	10.6 $e^+ e^- \rightarrow 2(\pi^+ \pi^-) \pi^0 \gamma$	

$\Gamma(\pi^+ \pi^- \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{88}\Gamma_5/\Gamma$
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.122±0.005±0.008		AUBERT,B	04N BABR	10.6 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$	

$\Gamma(\pi^+ \pi^- \pi^0 K^+ K^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{89}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
107.0±4.3±6.4	768	AUBERT	07AU BABR	10.6 $e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \pi^0 \gamma$	

$\Gamma(\pi^+ \pi^- K^+ K^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{91}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
36.3±1.3±2.1	1586 ± 58	AUBERT	07AK BABR	10.6 $e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •
33.6 ± 2.7 ± 2.7 233 ¹ AUBERT 05D BABR 10.6 $e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$

¹ Superseded by AUBERT 07AK.

$\Gamma(\pi^+ \pi^- K^+ K^- \eta) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{92}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
25.9±3.9±0.1	73	¹ AUBERT	07AU BABR	10.6 $e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \eta \gamma$	

¹ AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \pi^+ \pi^- K^+ K^- \eta) \times \Gamma(J/\psi(1S) \rightarrow e^+ e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 10.2 \pm 1.3 \pm 0.8$ eV which we divide by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^0 \pi^0 K^+ K^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{93}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
13.6±1.1±1.3	203 ± 16	AUBERT	07AK BABR	10.6 $e^+ e^- \rightarrow \pi^0 \pi^0 K^+ K^- \gamma$	

$\Gamma(2(\pi^+ \pi^-)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{95}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
20.4±1.0 OUR AVERAGE	[19.5 ± 1.9 eV OUR 2012 AVERAGE]				

20.4±0.9±0.4 LEES 12E BABR 10.6 $e^+ e^- \rightarrow 2\pi^+ 2\pi^- \gamma$
 • • • We do not use the following data for averages, fits, limits, etc. • • •

19.5 ± 1.4 ± 1.3 270 ¹ AUBERT 05D BABR 10.6 $e^+ e^- \rightarrow 2(\pi^+ \pi^-) \gamma$

¹ Superseded by LEES 12E.

$\Gamma(3(\pi^+ \pi^-)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{96}\Gamma_5/\Gamma$
VALUE (10 ⁻² keV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2.37±0.16±0.14	496	AUBERT	06D BABR	10.6 $e^+ e^- \rightarrow 3(\pi^+ \pi^-) \gamma$	

$\Gamma(2(\pi^+ \pi^- \pi^0)) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{97}\Gamma_5/\Gamma$
VALUE (10 ⁻² keV)	EVTS	DOCUMENT ID	TECN	COMMENT	
8.9±0.5±1.0	761	AUBERT	06D BABR	10.6 $e^+ e^- \rightarrow 2(\pi^+ \pi^- \pi^0) \gamma$	

$\Gamma(2(\pi^+ \pi^-) \eta) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{98}\Gamma_5/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
13.1±2.4±0.1	85	¹ AUBERT	07AU BABR	10.6 $e^+ e^- \rightarrow 2(\pi^+ \pi^-) \eta \gamma$	

¹ AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow 2(\pi^+ \pi^-) \eta) \times \Gamma(J/\psi(1S) \rightarrow e^+ e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 5.16 \pm 0.85 \pm 0.39$ eV which we divide by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M070G07
NODE=M070G07

NODE=M070G07;LINKAGE=AE
NODE=M070G07;LINKAGE=UB

NODE=M070G23
NODE=M070G23

NODE=M070G27
NODE=M070G27

NODE=M070G12
NODE=M070G12

NODE=M070G30
NODE=M070G30

NODE=M070G11
NODE=M070G11

NODE=M070G11;LINKAGE=AU

NODE=M070G6
NODE=M070G6

NODE=M070G7
NODE=M070G7

NODE=M070G26
NODE=M070G26;LINKAGE=AU

$\Gamma(p\bar{p}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
11.6±0.9 OUR AVERAGE Error includes scale factor of 1.2.				
12.0±0.6±0.5	438	AUBERT	06B	$e^+e^- \rightarrow p\bar{p}\gamma$
9.7±1.7		1 ARMSTRONG	93B E760	$\bar{p}p \rightarrow e^+e^-$

¹ Using $\Gamma_{\text{total}} = 85.5^{+6.1}_{-5.8}$ MeV.

 $\Gamma_{100}\Gamma_5/\Gamma$

NODE=M070G4
NODE=M070G4

 $\Gamma(\Sigma^0\bar{\Sigma}^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
6.4±1.2±0.6	AUBERT	07BD BABR	$10.6 e^+e^- \rightarrow \Sigma^0\bar{\Sigma}^0\gamma$

NODE=M070G;LINKAGE=A

 $\Gamma(2(\pi^+\pi^-)K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (10^{-2} keV)	EVTS	DOCUMENT ID	TECN	COMMENT
2.75±0.23±0.17	205	AUBERT	06D BABR	$10.6 e^+e^- \rightarrow K^+K^- 2(\pi^+\pi^-)\gamma$

NODE=M070G9
NODE=M070G9

 $\Gamma(\Lambda\bar{\Lambda}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
10.7±0.9±0.7	AUBERT	07BD BABR	$10.6 e^+e^- \rightarrow \Lambda\bar{\Lambda}\gamma$

NODE=M070G16
NODE=M070G16

 $\Gamma(2(K^+K^-)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
4.11±0.39±0.30	156 ± 15	AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow 2(K^+K^-)\gamma$

NODE=M070G13
NODE=M070G13

• • • We do not use the following data for averages, fits, limits, etc. • • •

4.0 ± 0.7 ± 0.6	38	¹ AUBERT	05D BABR	$10.6 e^+e^- \rightarrow 2(K^+K^-)\gamma$
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¹ Superseded by AUBERT 07AK.

J/ ψ (1S) BRANCHING RATIOS

For the first four branching ratios, see also the partial widths, and (partial widths) $\times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ above.

 $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.877±0.005 OUR AVERAGE			
0.878±0.005	BAI	95B BES	e^+e^-
0.86 ± 0.02	BOYARSKI	75 MRK1	e^+e^-

 Γ_1/Γ

NODE=M070R3
NODE=M070R3

 $\Gamma(\text{virtual } \gamma \rightarrow \text{hadrons})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.135±0.003	1,2 SETH	04 RVUE	e^+e^-

NODE=M070R4
NODE=M070R4

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.17 ± 0.02	¹ BOYARSKI	75 MRK1	e^+e^-
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¹ Included in $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$.

² Using $B(J/\psi \rightarrow \ell^+\ell^-) = (5.90 \pm 0.09)\%$ from RPP-2002 and $R = 2.28 \pm 0.04$ determined by a fit to data from BAI 00 and BAI 02C.

 Γ_2/Γ

NODE=M070R4;LINKAGE=C
NODE=M070R4;LINKAGE=SE

 $\Gamma(ggg)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
64.1±1.0	6 M	¹ BESSON	08 CLEO	$\psi(2S) \rightarrow \pi^+\pi^- + \text{hadrons}$

 Γ_3/Γ

NODE=M070S65
NODE=M070S65

¹ Calculated using the value $\Gamma(\gamma gg)/\Gamma(ggg) = 0.137 \pm 0.001 \pm 0.016 \pm 0.004$ from BESSON 08 and the PDG 08 values of $B(\ell^+\ell^-)$, $B(\text{virtual } \gamma \rightarrow \text{hadrons})$, and $B(\gamma\eta_C)$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(\gamma gg)/\Gamma_{\text{total}}$ measurement of BESSON 08.

 $\Gamma(\gamma gg)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
8.79±1.05	200 k	¹ BESSON	08 CLEO	$\psi(2S) \rightarrow \pi^+\pi^-\gamma + \text{hadrons}$

NODE=M070S66
NODE=M070S66

¹ Calculated using the value $\Gamma(\gamma gg)/\Gamma(ggg) = 0.137 \pm 0.001 \pm 0.016 \pm 0.004$ from BESSON 08 and the value of $\Gamma(ggg)/\Gamma_{\text{total}}$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ measurement of BESSON 08.

NODE=M070S66;LINKAGE=BE

$\Gamma(\gamma gg)/\Gamma(ggg)$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ_3
$13.7 \pm 0.1 \pm 0.7$	6 M	BESSON	08	CLEO $\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$	NODE=M070S67 NODE=M070S67

 $\Gamma(e^+ e^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_5/Γ
5.94 ± 0.06 OUR AVERAGE					NODE=M070R1 NODE=M070R1
5.945 $\pm 0.067 \pm 0.042$	15k	LI	05C	CLEO $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
5.90 $\pm 0.05 \pm 0.10$		BAI	98D	BES $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
6.09 ± 0.33		BAI	95B	BES $e^+ e^-$	
5.92 $\pm 0.15 \pm 0.20$		COFFMAN	92	MRK3 $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
6.9 ± 0.9		BOYARSKI	75	MRK1 $e^+ e^-$	

 $\Gamma(e^+ e^- \gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_6/Γ
$8.8 \pm 1.3 \pm 0.4$		¹ ARMSTRONG	96	E760 $\bar{p}p \rightarrow e^+ e^- \gamma$	NODE=M070S33 NODE=M070S33

¹ For $E_\gamma > 100$ MeV.

 $\Gamma(\mu^+ \mu^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ
5.93 ± 0.06 OUR AVERAGE					NODE=M070R2 NODE=M070R2
5.960 $\pm 0.065 \pm 0.050$	17k	LI	05C	CLEO $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
5.84 $\pm 0.06 \pm 0.10$		BAI	98D	BES $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
6.08 ± 0.33		BAI	95B	BES $e^+ e^-$	
5.90 $\pm 0.15 \pm 0.19$		COFFMAN	92	MRK3 $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
6.9 ± 0.9		BOYARSKI	75	MRK1 $e^+ e^-$	

 $\Gamma(e^+ e^-)/\Gamma(\mu^+ \mu^-)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_5/Γ_7
0.998 ± 0.012 OUR AVERAGE				NODE=M070R5 NODE=M070R5
1.002 $\pm 0.021 \pm 0.013$	¹ ANASHIN	10	KEDR $3.097 e^+ e^- \rightarrow e^+ e^-$, $\mu^+ \mu^-$	
0.997 $\pm 0.012 \pm 0.006$	LI	05C	CLEO $\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.00 ± 0.07	BAI	95B	BES $e^+ e^-$	
1.00 ± 0.05	BOYARSKI	75	MRK1 $e^+ e^-$	
0.91 ± 0.15	ESPOSITO	75B	FRAM $e^+ e^-$	
0.93 ± 0.10	FORD	75	SPEC $e^+ e^-$	

¹ Not independent of the corresponding measurements of $\Gamma(e^+ e^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$ and $\Gamma(\mu^+ \mu^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$.

HADRONIC DECAYS

 $\Gamma(\rho\pi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_8/Γ
1.69 ± 0.15 OUR AVERAGE				Error includes scale factor of 2.4. See the ideogram below.	
2.18 ± 0.19		1,2 AUBERT,B	04N	BABR $10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$	
2.184 $\pm 0.005 \pm 0.201$	220k	2,3 BAI	04H	BES $e^+ e^- \rightarrow J/\psi \rightarrow \pi^+ \pi^- \pi^0$	
2.091 $\pm 0.021 \pm 0.116$		2,4 BAI	04H	BES $\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$	OCCUR=2
1.21 ± 0.20		BAI	96D	BES $e^+ e^- \rightarrow \rho \pi$	
1.42 $\pm 0.01 \pm 0.19$		COFFMAN	88	MRK3 $e^+ e^-$	
1.3 ± 0.3	150	FRANKLIN	83	MRK2 $e^+ e^-$	
1.6 ± 0.4	183	ALEXANDER	78	PLUT $e^+ e^-$	
1.33 ± 0.21		BRANDELIK	78B	DASP $e^+ e^-$	
1.0 ± 0.2	543	BARTEL	76	CNTR $e^+ e^-$	
1.3 ± 0.3	153	JEAN-MARIE	76	MRK1 $e^+ e^-$	

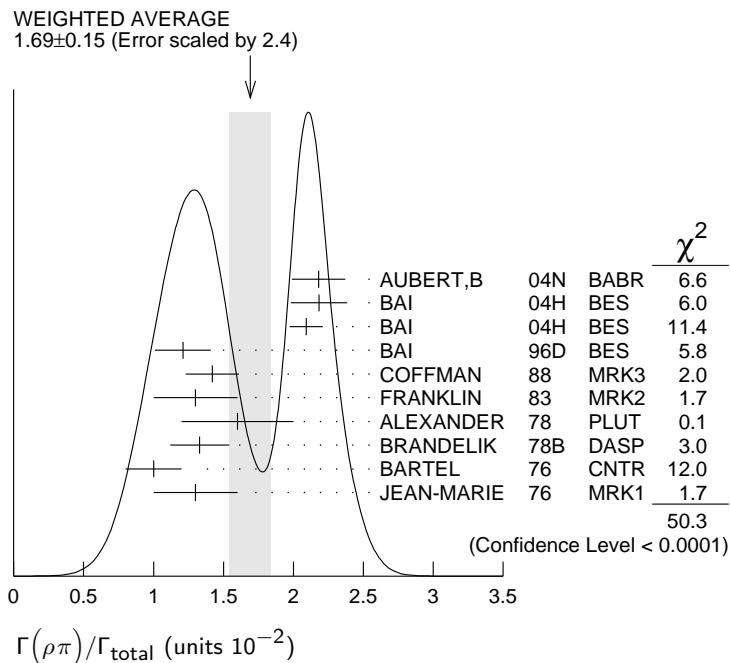
¹ From the ratio of $\Gamma(e^+ e^-) B(\pi^+ \pi^- \pi^0)$ and $\Gamma(e^+ e^-) B(\mu^+ \mu^-)$ (AUBERT 04).

² Not independent of their $B(\pi^+ \pi^- \pi^0)$.

³ From $J/\psi \rightarrow \pi^+ \pi^- \pi^0$ events directly.

⁴ Obtained comparing the rates for $\pi^+ \pi^- \pi^0$ and $\mu^+ \mu^-$, using J/ψ events produced via $\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$ and with $B(J/\psi \rightarrow \mu^+ \mu^-) = 5.88 \pm 0.10\%$.

NODE=M070R20
NODE=M070R20

 $\Gamma(\rho^0\pi^0)/\Gamma(\rho\pi)$

VALUE	DOCUMENT ID	TECN	COMMENT
0.328±0.005±0.027	COFFMAN	88	MRK3 $e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.35 ± 0.08	ALEXANDER	78	PLUT $e^+ e^-$
0.32 ± 0.08	BRANDELIK	78B	DASP $e^+ e^-$
0.39 ± 0.11	BARTEL	76	CNTR $e^+ e^-$
0.37 ± 0.09	JEAN-MARIE	76	MRK1 $e^+ e^-$

 Γ_9/Γ_8

NODE=M070R21
NODE=M070R21

 $\Gamma(a_2(1320)\rho)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
10.9±2.2 OUR AVERAGE				
11.7±0.7±2.5	7584	AUGUSTIN	89	DM2 $J/\psi \rightarrow \rho^0 \rho \pm \pi^\mp$
8.4±4.5	36	VANNUCCI	77	MRK1 $e^+ e^- \rightarrow 2(\pi^+ \pi^-) \pi^0$

 Γ_{10}/Γ

NODE=M070R43
NODE=M070R43

 $\Gamma(\omega\pi^+\pi^+\pi^-\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
85±34	140	VANNUCCI	77	MRK1 $e^+ e^- \rightarrow 3(\pi^+ \pi^-) \pi^0$

 Γ_{11}/Γ

NODE=M070R26
NODE=M070R26

 $\Gamma(\omega\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
0.40±0.06±0.04	170	¹ AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow \omega\pi^+\pi^-\pi^0\gamma$

¹ Using $\Gamma(J/\psi \rightarrow e^+ e^-) = 5.52 \pm 0.14 \pm 0.04$ keV.

 Γ_{12}/Γ

NODE=M070R76
NODE=M070R76

 $\Gamma(\omega\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
8.6±0.7 OUR AVERAGE Error includes scale factor of 1.1.				
9.7±0.6±0.6	788	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega\pi^+\pi^-\gamma$
7.0±1.6	18058	AUGUSTIN	89 DM2	$J/\psi \rightarrow 2(\pi^+\pi^-)\pi^0$
7.8±1.6	215	BURMESTER	77D PLUT	$e^+ e^-$
6.8±1.9	348	VANNUCCI	77 MRK1	$e^+ e^- \rightarrow 2(\pi^+\pi^-)\pi^0$

 Γ_{13}/Γ

NODE=M070R24
NODE=M070R24

¹ AUBERT 07AU quotes $\Gamma_{ee}^{J/\psi} \cdot B(J/\psi \rightarrow \omega\pi^+\pi^-) \cdot B(\omega \rightarrow 3\pi) = 47.8 \pm 3.1 \pm 3.2$ eV.

NODE=M070R24;LINKAGE=EE

 $\Gamma(\omega f_2(1270))/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
4.3±0.6 OUR AVERAGE				
4.3±0.2±0.6	5860	AUGUSTIN	89 DM2	$e^+ e^-$
4.0±1.6	70	BURMESTER	77D PLUT	$e^+ e^-$

 Γ_{14}/Γ

NODE=M070R28
NODE=M070R28

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.9±0.8 81 VANNUCCI 77 MRK1 $e^+ e^- \rightarrow 2(\pi^+\pi^-)\pi^0$

$\Gamma(K^*(892)^0 \bar{K}^*(892)^0) / \Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
2.3±0.7±0.1		25 ± 8	1 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<5	90	VANNUCCI 77	MRK1	$e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^-$
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¹ AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow K^*(892)^0 \bar{K}^*(892)^0) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (1.28 \pm 0.40 \pm 0.11) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^*(892)^{\pm} \bar{K}^*(892)^{\mp}) / \Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.00±0.19±0.11	323	ABLIKIM	10E BES2	$J/\psi \rightarrow K^{\pm} K_S^0 \pi^{\mp} \pi^0$

 $\Gamma(K^*(892)^{\pm} \bar{K}^*(800)^{\mp}) / \Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.09±0.18±0.94	655	ABLIKIM	10E BES2	$J/\psi \rightarrow K^{\pm} K_S^0 \pi^{\mp} \pi^0$

 $\Gamma(\eta K^*(892)^0 \bar{K}^*(892)^0) / \Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.15±0.13±0.22	209	ABLIKIM	10C BES2	$J/\psi \rightarrow \eta K^+ \pi^- K^- \pi^+$

 $\Gamma(K^*(892)^0 \bar{K}_2^*(1430)^0 + \text{c.c.}) / \Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
6.0±0.6 OUR AVERAGE				

5.9±0.6±0.2	317 ± 23	1,2 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$
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6.7±2.6	40	VANNUCCI 77	MRK1	$e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^-$
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¹ Using $B(K_2^*(1430)^0 \rightarrow K\pi) = (49.9 \pm 1.2)\%$.

² AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow K^*(892)^0 \bar{K}_2^*(1430)^0 + \text{c.c.}) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (32.9 \pm 2.3 \pm 2.7) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\omega K^*(892) \bar{K} + \text{c.c.}) / \Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
61 ± 9 OUR AVERAGE				

62.0±6.8±10.6	899 ± 98	ABLIKIM	08E BES2	$J/\psi \rightarrow \omega K_S^0 K^{\pm} \pi^{\mp}$
65.3±10.2±13.5	176 ± 28	ABLIKIM	08E BES2	$J/\psi \rightarrow \omega K^+ K^- \pi^0$
53 ± 14 ± 14	530 ± 140	BECKER	87 MRK3	$e^+ e^- \rightarrow \text{hadrons}$

 $\Gamma(K^+ \bar{K}^*(892)^- + \text{c.c.}) / \Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
5.12±0.30 OUR AVERAGE				

5.2 ± 0.4 ± 0.1		1 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow K^+ K^*(892)^- \gamma$
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4.57±0.17±0.70	2285	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$
5.26±0.13±0.53		COFFMAN	88 MRK3	$J/\psi \rightarrow K^{\pm} K_S^0 \pi^{\mp}, K^+ K^- \pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.6 ± 0.6	24	FRANKLIN	83 MRK2	$J/\psi \rightarrow K^+ K^- \pi^0$
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3.2 ± 0.6	48	VANNUCCI	77 MRK1	$J/\psi \rightarrow K^{\pm} K_S^0 \pi^{\mp}$
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4.1 ± 1.2	39	BRAUNSCH...	76 DASP	$J/\psi \rightarrow K^{\pm} X$
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¹ AUBERT 08S reports $[\Gamma(J/\psi(1S) \rightarrow K^+ \bar{K}^*(892)^- + \text{c.c.}) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (29.0 \pm 1.7 \pm 1.3) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 Γ_{15}/Γ

NODE=M070R46
NODE=M070R46

NODE=M070R46;LINKAGE=BE

 Γ_{16}/Γ

NODE=M070S73
NODE=M070S73

 Γ_{17}/Γ

NODE=M070S74
NODE=M070S74

 Γ_{18}/Γ

NODE=M070S69
NODE=M070S69

 Γ_{19}/Γ

NODE=M070R48
NODE=M070R48

NODE=M070R48;LINKAGE=AU
NODE=M070R48;LINKAGE=BE

 Γ_{21}/Γ

NODE=M070S2

NODE=M070S2

OCCUR=2

 Γ_{22}/Γ

NODE=M070S15

NODE=M070S15

NODE=M070S15;LINKAGE=AU

$\Gamma(K^+ \bar{K}^*(892)^- + c.c. \rightarrow K^+ K^- \pi^0) / \Gamma_{\text{total}}$
 Γ_{23}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.97 \pm 0.20 \pm 0.05$	155	1 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^0 \gamma$ 1 AUBERT 08S reports $[\Gamma(J/\psi(1S) \rightarrow K^+ \bar{K}^*(892)^- + c.c. \rightarrow K^+ K^- \pi^0) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (10.96 \pm 0.85 \pm 0.70) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^+ \bar{K}^*(892)^- + c.c. \rightarrow K^0 K^\pm \pi^\mp) / \Gamma_{\text{total}}$
 Γ_{24}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.0 \pm 0.4 \pm 0.1$	89	1 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow K_S^0 K^\pm \pi^\mp \gamma$ 1 AUBERT 08S reports $[\Gamma(J/\psi(1S) \rightarrow K^+ \bar{K}^*(892)^- + c.c. \rightarrow K^0 K^\pm \pi^\mp) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (16.76 \pm 1.70 \pm 1.00) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^0 \bar{K}^*(892)^0 + c.c.) / \Gamma_{\text{total}}$
 Γ_{25}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
4.39 ± 0.31 OUR AVERAGE				
$4.8 \pm 0.5 \pm 0.1$		1 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow K_0^0 \bar{K}^*(892)^0 \gamma$
$3.96 \pm 0.15 \pm 0.60$	1192	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$
$4.33 \pm 0.12 \pm 0.45$		COFFMAN	88 MRK3	$J/\psi \rightarrow K^\pm K_S^0 \pi^\mp$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
2.7 ± 0.6	45	VANNUCCI	77 MRK1	$J/\psi \rightarrow K^\pm K_S^0 \pi^\mp$
1 AUBERT 08S reports $[\Gamma(J/\psi(1S) \rightarrow K^0 \bar{K}^*(892)^0 + c.c.) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (26.6 \pm 2.5 \pm 1.5) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(K^0 \bar{K}^*(892)^0 + c.c.) / \Gamma(K^+ \bar{K}^*(892)^- + c.c.)$
 Γ_{25}/Γ_{22}

VALUE	DOCUMENT ID	TECN	COMMENT
$0.82 \pm 0.05 \pm 0.09$	COFFMAN	88 MRK3	$J/\psi \rightarrow K \bar{K}^*(892)^0 + c.c.$

 $\Gamma(K^0 \bar{K}^*(892)^0 + c.c. \rightarrow K^0 K^\pm \pi^\mp) / \Gamma_{\text{total}}$
 Γ_{26}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.2 \pm 0.4 \pm 0.1$	94	1 AUBERT	08S BABR	$10.6 e^+ e^- \rightarrow K_S^0 K^\pm \pi^\mp \gamma$ 1 AUBERT 08S reports $[\Gamma(J/\psi(1S) \rightarrow K^0 \bar{K}^*(892)^0 + c.c. \rightarrow K^0 K^\pm \pi^\mp) / \Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (17.70 \pm 1.70 \pm 1.00) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K_1(1400)^\pm K^\mp) / \Gamma_{\text{total}}$
 Γ_{27}/Γ

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
$3.8 \pm 0.8 \pm 1.2$	1 BAI	99C BES	$e^+ e^-$ 1 Assuming $B(K_1(1400) \rightarrow K^* \pi) = 0.94 \pm 0.06$

 $\Gamma(\bar{K}^*(892)^0 K^+ \pi^- + c.c.) / \Gamma_{\text{total}}$
 Γ_{28}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	1 ABLIKIM	06C BES2	$J/\psi \rightarrow \bar{K}^*(892)^0 K^+ \pi^-$ 1 A $K_0^*(800)$ is observed by ABLIKIM 06C in the $K^+ \pi^-$ mass spectrum of the $\bar{K}^*(892)^0 K^+ \pi^-$ final state against the $\bar{K}^*(892)$. A corresponding branching fraction of the $J/\psi(1S)$ is not presented.

 $\Gamma(\omega \pi^0 \pi^0) / \Gamma_{\text{total}}$
 Γ_{29}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.4 \pm 0.3 \pm 0.7$	509	AUGUSTIN	89 DM2	$J/\psi \rightarrow \pi^+ \pi^- 3\pi^0$

 $\Gamma(b_1(1235)^\pm \pi^\mp) / \Gamma_{\text{total}}$
 Γ_{30}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
30 ± 5 OUR AVERAGE	4600	AUGUSTIN	89 DM2	$J/\psi \rightarrow 2(\pi^+ \pi^-) \pi^0$
31 ± 6	87	BURMESTER	77D PLUT	$e^+ e^-$
29 ± 7				

NODE=M070R09
NODE=M070R09

NODE=M070R09;LINKAGE=AU

NODE=M070S58
NODE=M070S58

NODE=M070S58;LINKAGE=AU

NODE=M070S16
NODE=M070S16

NODE=M070S16;LINKAGE=AU

NODE=M070S17
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NODE=M070S59

NODE=M070S59;LINKAGE=AU

NODE=M070S35
NODE=M070S35

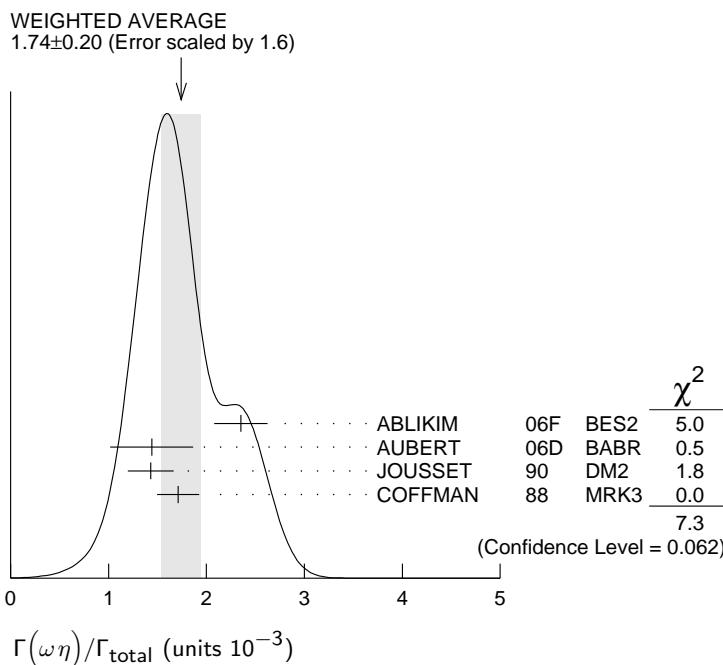
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NODE=M070S52
NODE=M070S52

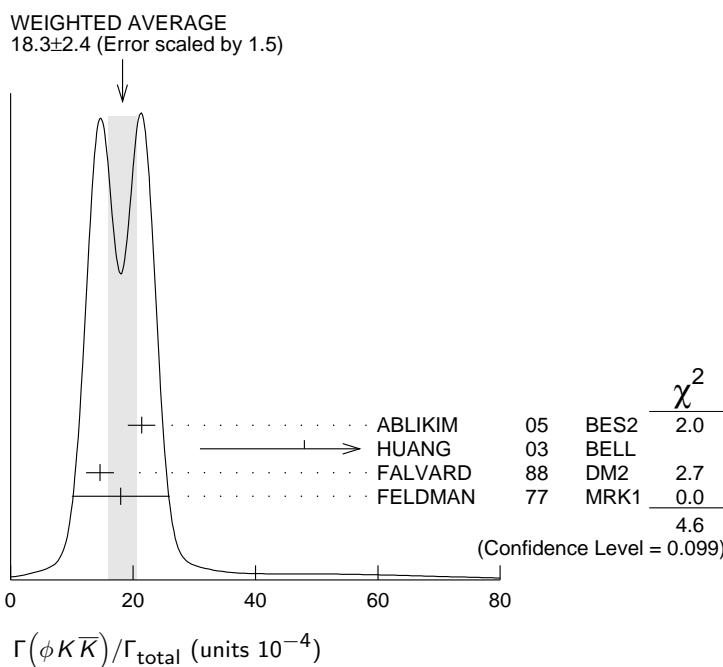
NODE=M070S52;LINKAGE=AB

NODE=M070S26
NODE=M070S26NODE=M070R49
NODE=M070R49

$\Gamma(\omega K^\pm K_S^0 \pi^\mp)/\Gamma_{\text{total}}$				Γ_{31}/Γ	NODE=M070S1 NODE=M070S1
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
34 ± 5 OUR AVERAGE					
37.7 ± 0.8 ± 5.8	1972 ± 41	ABLIKIM	08E BES2	$e^+ e^- \rightarrow J/\psi$	
29.5 ± 1.4 ± 7.0	879 ± 41	BECKER	87 MRK3	$e^+ e^- \rightarrow \text{hadrons}$	
$\Gamma(b_1(1235)^0 \pi^0)/\Gamma_{\text{total}}$				Γ_{32}/Γ	NODE=M070S28 NODE=M070S28
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
23 ± 3 ± 5	229	AUGUSTIN	89 DM2	$e^+ e^-$	
$\Gamma(\eta K^\pm K_S^0 \pi^\mp)/\Gamma_{\text{total}}$				Γ_{33}/Γ	NODE=M070S57 NODE=M070S57
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
21.8 ± 2.2 ± 3.4	232 ± 23	ABLIKIM	08E BES2	$e^+ e^- \rightarrow J/\psi$	
$\Gamma(\phi K^*(892) \bar{K} + \text{c.c.})/\Gamma_{\text{total}}$				Γ_{34}/Γ	NODE=M070S4 NODE=M070S4
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
21.8 ± 2.3 OUR AVERAGE					
20.8 ± 2.7 ± 3.9	195 ± 25	ABLIKIM	08E BES2	$J/\psi \rightarrow \phi K_S^0 K^\pm \pi^\mp$	
29.6 ± 3.7 ± 4.7	238 ± 30	ABLIKIM	08E BES2	$J/\psi \rightarrow \phi K^+ K^- \pi^0$	
20.7 ± 2.4 ± 3.0		FALVARD	88 DM2	$J/\psi \rightarrow \text{hadrons}$	
20 ± 3 ± 3	155 ± 20	BECKER	87 MRK3	$e^+ e^- \rightarrow \text{hadrons}$	
$\Gamma(\omega K \bar{K})/\Gamma_{\text{total}}$				Γ_{35}/Γ	NODE=M070R27 NODE=M070R27
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
17.0 ± 3.2 OUR AVERAGE					
13.6 ± 5.0 ± 1.0	24	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega K^+ K^- \gamma$	
19.8 ± 2.1 ± 3.9		² FALVARD	88 DM2	$J/\psi \rightarrow \text{hadrons}$	
16 ± 10	22	FELDMAN	77 MRK1	$e^+ e^-$	
¹ AUBERT 07AU quotes $\Gamma_{ee}^{J/\psi} \cdot B(J/\psi \rightarrow \omega K^+ K^-) \cdot B(\eta \rightarrow 3\pi) = 3.3 \pm 1.3 \pm 0.2 \text{ eV}$.					
² Addition of $\omega K^+ K^-$ and $\omega K^0 \bar{K}^0$ branching ratios.					
$\Gamma(\omega f_0(1710) \rightarrow \omega K \bar{K})/\Gamma_{\text{total}}$				Γ_{36}/Γ	NODE=M070S25 NODE=M070S25
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
4.8 ± 1.1 ± 0.3		1,2 FALVARD	88 DM2	$J/\psi \rightarrow \text{hadrons}$	
¹ Includes unknown branching fraction $f_0(1710) \rightarrow K \bar{K}$.					
² Addition of $f_0(1710) \rightarrow K^+ K^-$ and $f_0(1710) \rightarrow K^0 \bar{K}^0$ branching ratios.					
$\Gamma(\phi 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$				Γ_{37}/Γ	NODE=M070R35 NODE=M070R35
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
16.6 ± 2.3 OUR AVERAGE					
17.3 ± 3.3 ± 1.2	35	¹ AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow \phi 2(\pi^+ \pi^-) \gamma$	
16.0 ± 1.0 ± 3.0		FALVARD	88 DM2	$J/\psi \rightarrow \text{hadrons}$	
¹ Using $\Gamma(J/\psi \rightarrow e^+ e^-) = 5.52 \pm 0.14 \pm 0.04 \text{ keV}$.					
$\Gamma(\Delta(1232)^{++} \bar{p} \pi^-)/\Gamma_{\text{total}}$				Γ_{38}/Γ	NODE=M070R70 NODE=M070R70
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.58 ± 0.23 ± 0.40	332	EATON	84 MRK2	$e^+ e^-$	
$\Gamma(\omega \eta)/\Gamma_{\text{total}}$				Γ_{39}/Γ	NODE=M070R30 NODE=M070R30
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.74 ± 0.20 OUR AVERAGE				Error includes scale factor of 1.6. See the ideogram below.	
2.352 ± 0.273	5k	¹ ABLIKIM	06F BES2	$J/\psi \rightarrow \omega \eta$	
1.44 ± 0.40 ± 0.14	13	² AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow \omega \eta \gamma$	
1.43 ± 0.10 ± 0.21	378	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$	
1.71 ± 0.08 ± 0.20		COFFMAN	88 MRK3	$e^+ e^- \rightarrow 3\pi \eta$	
¹ Using $B(\eta \rightarrow 2\gamma) = (39.43 \pm 0.26)\%$, $B(\eta \rightarrow \pi^+ \pi^- \pi^0) = 22.6 \pm 0.4\%$, $B(\eta \rightarrow \pi^+ \pi^- \gamma) = 4.68 \pm 0.11\%$, and $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.1 \pm 0.7)\%$.					
² Using $\Gamma(J/\psi \rightarrow e^+ e^-) = 5.52 \pm 0.14 \pm 0.04 \text{ keV}$.					

 $\Gamma(\phi K\bar{K})/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
18.3± 2.4 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.			
21.4± 0.4±2.2		ABLIKIM	05	$J/\psi \rightarrow \phi\pi^+\pi^-$
48 ± 20 ± 6	9.0 ± 3.7	1,2 HUANG	03	$B^+ \rightarrow (\phi K^+ K^-) K^+$
14.6± 0.8±2.1		3 FALVARD	88	$J/\psi \rightarrow \text{hadrons}$
18 ± 8	14	FELDMAN	77	$e^+ e^-$

1 We have multiplied $K^+ K^-$ measurement by 2 to obtain $K\bar{K}$.2 Using $B(B^+ \rightarrow J/\psi K^+) = (1.01 \pm 0.05) \times 10^{-3}$.3 Addition of $\phi K^+ K^-$ and $\phi K^0 \bar{K}^0$ branching ratios. Γ_{40}/Γ NODE=M070R36
NODE=M070R36 $\Gamma(\phi f_0(1710) \rightarrow \phi K\bar{K})/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
3.6±0.2±0.6	1,2 FALVARD	88	$J/\psi \rightarrow \text{hadrons}$

1 Including interference with $f_2'(1525)$.2 Includes unknown branching fraction $f_0(1710) \rightarrow K\bar{K}$. Γ_{41}/Γ NODE=M070S24
NODE=M070S24NODE=M070S24;LINKAGE=D
NODE=M070S24;LINKAGE=E

$\Gamma(\phi f_2(1270))/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.72±0.13±0.02		44 ± 7	1,2 AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 0.45	90	FALVARD	88	DM2	$J/\psi \rightarrow \text{hadrons}$
< 0.37	90	VANNUCCI	77	MRK1	$e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^-$

1 Using $B(f_2(1270) \rightarrow \pi\pi) = (84.8^{+2.4}_{-1.2})\%$

2 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \phi f_2(1270))/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (4.02 \pm 0.65 \pm 0.33) \times 10^{-3} \text{ keV}$ which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02 \text{ keV}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\Delta(1232)^{++} \bar{\Delta}(1232)^{-})/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.10±0.09±0.28	233	EATON	84	MRK2 $e^+ e^-$

 $\Gamma(\Sigma(1385)^- \bar{\Sigma}(1385)^+ (\text{or c.c.}))/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.10±0.12 OUR AVERAGE				

$[(1.03 \pm 0.13) \times 10^{-3} \text{ OUR 2012 AVERAGE}]$

1.23±0.07±0.30	0.8k	ABLIKIM	12P	BES2	$J/\psi \rightarrow \Sigma(1385)^- \bar{\Sigma}(1385)^+$
1.50±0.08±0.38	1k	ABLIKIM	12P	BES2	$J/\psi \rightarrow \Sigma(1385)^+ \bar{\Sigma}(1385)^-$
1.00±0.04±0.21	0.6k	HENRARD	87	DM2	$e^+ e^- \rightarrow \Sigma^*$
1.19±0.04±0.25	0.7k	HENRARD	87	DM2	$e^+ e^- \rightarrow \Sigma^+$
0.86±0.18±0.22	56	EATON	84	MRK2	$e^+ e^- \rightarrow \Sigma^*$
1.03±0.24±0.25	68	EATON	84	MRK2	$e^+ e^- \rightarrow \Sigma^+$

 $\Gamma(\phi f'_2(1525))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
8 ± 4 OUR AVERAGE				Error includes scale factor of 2.7.

12.3±0.6±2.0		1,2 FALVARD	88	DM2	$J/\psi \rightarrow \text{hadrons}$
4.8±1.8	46	1 GIDAL	81	MRK2	$J/\psi \rightarrow K^+ K^- K^+ K^-$

1 Re-evaluated using $B(f'_2(1525) \rightarrow K\bar{K}) = 0.713$.

2 Including interference with $f_0(1710)$.

 $\Gamma(\phi\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.94±0.09 OUR AVERAGE				Error includes scale factor of 1.2.

0.96±0.13	103	1 AUBERT,BE	06D	BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$
1.09±0.02±0.13		ABLIKIM	05	BES2	$J/\psi \rightarrow \phi\pi^+\pi^-$
0.78±0.03±0.12		FALVARD	88	DM2	$J/\psi \rightarrow \text{hadrons}$
2.1 ± 0.9	23	FELDMAN	77	MRK1	$e^+ e^-$

1 Derived by us. AUBERT,BE 06D measures $\Gamma(J/\psi \rightarrow e^+ e^-) \times B(J/\psi \rightarrow \phi\pi^+\pi^-) \times B(\phi \rightarrow K^+ K^-) = (2.61 \pm 0.30 \pm 0.18) \text{ eV}$

 $\Gamma(\phi\pi^0\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.56±0.16	23	1 AUBERT,BE	06D	BABR

1 Derived by us. AUBERT,BE 06D measures $\Gamma(J/\psi \rightarrow e^+ e^-) \times B(J/\psi \rightarrow \phi\pi^0\pi^0) \times B(\phi \rightarrow K^+ K^-) = (1.54 \pm 0.40 \pm 0.16) \text{ eV}$

 $\Gamma(\phi K^\pm K_S^0 \pi^\mp)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
7.2±0.8 OUR AVERAGE				

7.4±0.6±1.4	227 ± 19	ABLIKIM	08E	BES2	$e^+ e^- \rightarrow J/\psi$
7.4±0.9±1.1		FALVARD	88	DM2	$J/\psi \rightarrow \text{hadrons}$
7 ± 0.6 ± 1.0	163 ± 15	BECKER	87	MRK3	$e^+ e^- \rightarrow \text{hadrons}$

 $\Gamma(\omega f_1(1420))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
6.8^{+1.9}_{-1.6}±1.7	111 ⁺³¹ ₋₂₆	BECKER	87	MRK3 $e^+ e^- \rightarrow \text{hadrons}$

 Γ_{42}/Γ

NODE=M070R39

NODE=M070R39

NODE=M070R66

NODE=M070R66

NODE=M070R67

NODE=M070R67

NEW

OCCUR=2

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NODE=M070R40

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NODE=M070S3

NODE=M070S3

NODE=M070S5

NODE=M070S5

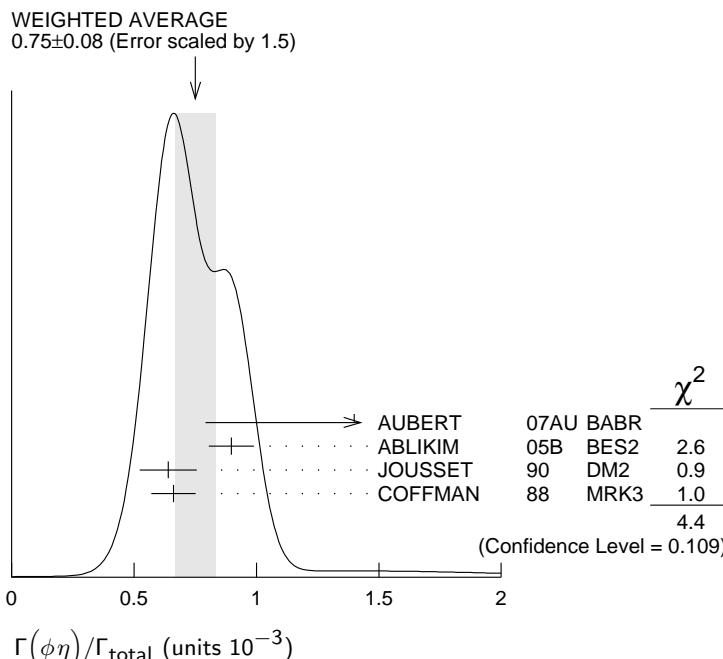
$\Gamma(\phi\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.75 ± 0.08 OUR AVERAGE				Error includes scale factor of 1.5. See the ideogram below.
1.4 ± 0.6 ± 0.1	6	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \phi\eta\gamma$
0.898 ± 0.024 ± 0.089		ABLIKIM	05B BES2	$e^+ e^- \rightarrow J/\psi \rightarrow \text{hadrons}$
0.64 ± 0.04 ± 0.11	346	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$
0.661 ± 0.045 ± 0.078		COFFMAN	88 MRK3	$e^+ e^- \rightarrow K^+ K^- \eta$

¹AUBERT 07AU quotes $\Gamma_{ee}^{J/\psi} \cdot B(J/\psi \rightarrow \phi\eta) \cdot B(\phi \rightarrow K^+ K^-) \cdot B(\eta \rightarrow \gamma\gamma) = 0.84 \pm 0.37 \pm 0.05 \text{ eV}$.

 Γ_{50}/Γ

NODE=M070R37
NODE=M070R37

 $\Gamma(\Xi^0 \bar{\Xi}^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.20 ± 0.12 ± 0.21	206	ABLIKIM	080 BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{51}/Γ

NODE=M070S64
NODE=M070S64

 $\Gamma(\Xi(1530)^- \bar{\Xi}^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.59 ± 0.09 ± 0.12	75 ± 11	HENRARD	87 DM2	$e^+ e^-$

 Γ_{52}/Γ

NODE=M070S9
NODE=M070S9

 $\Gamma(\rho K^- \bar{\Sigma}(1385)^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.51 ± 0.26 ± 0.18	89	EATON	84 MRK2	$e^+ e^-$

 Γ_{53}/Γ

NODE=M070R74
NODE=M070R74

 $\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.45 ± 0.05 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below.
0.538 ± 0.012 ± 0.065	2090	¹ ABLIKIM	06F BES2	$J/\psi \rightarrow \omega\pi^0$
0.360 ± 0.028 ± 0.054	222	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$

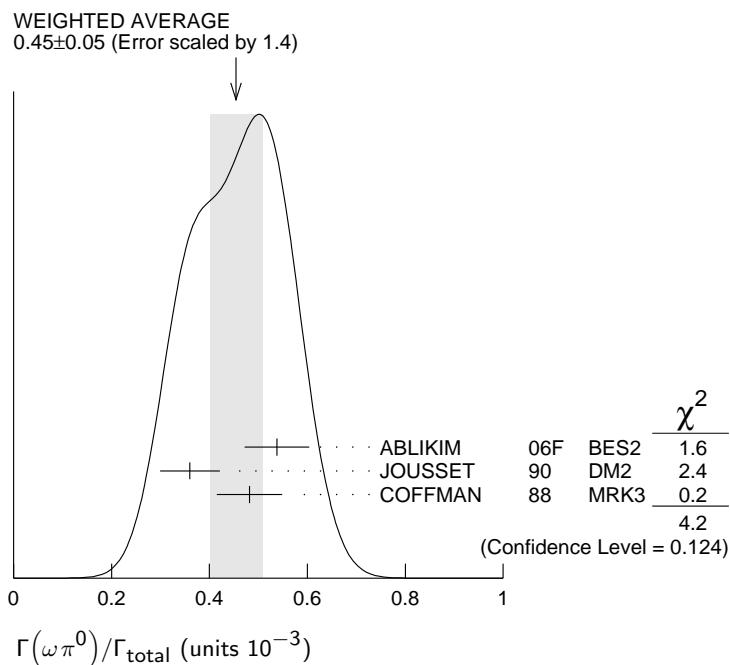
0.482 ± 0.019 ± 0.064 COFFMAN 88 MRK3 $e^+ e^- \rightarrow \pi^0 \pi^+ \pi^- \pi^0$

 Γ_{54}/Γ

NODE=M070R32
NODE=M070R32

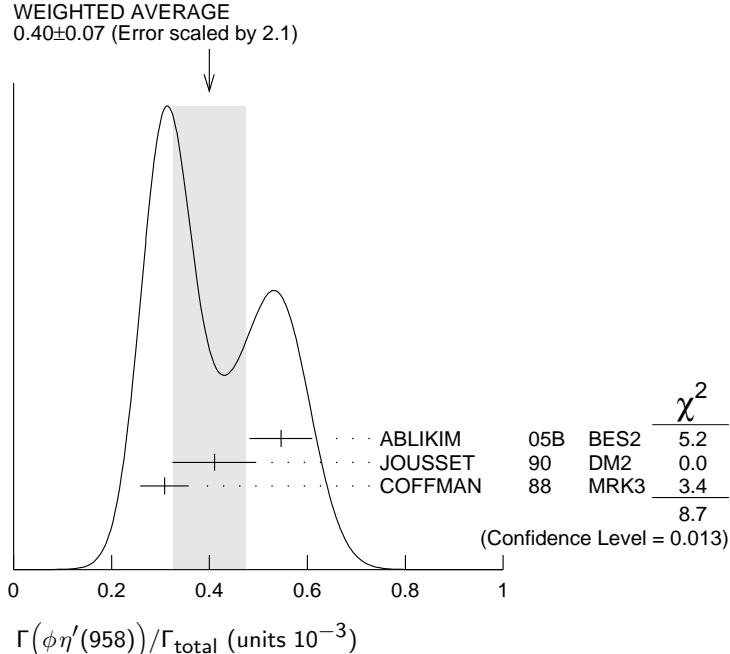
¹ Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.1 \pm 0.7)\%$.

NODE=M070R32;LINKAGE=BL



$\Gamma(\phi\eta'(958))/\Gamma_{\text{total}}$					Γ_{55}/Γ
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.40 ± 0.07 OUR AVERAGE	Error includes scale factor of 2.1. See the ideogram below.				
0.546±0.031±0.056			ABLIKIM	05B	BES2 $e^+ e^- \rightarrow J/\psi \rightarrow \text{hadr}$
0.41 ± 0.03 ± 0.08	167		JOUSSET	90	DM2 $J/\psi \rightarrow \text{hadrons}$
0.308±0.034±0.036			COFFMAN	88	MRK3 $e^+ e^- \rightarrow K^+ K^- \eta'$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 1.3	90	VANNUCCI	77	MRK1	$e^+ e^-$

NODE=M070R38
NODE=M070R38



$\Gamma(\phi f_0(980))/\Gamma_{\text{total}}$					Γ_{56}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.2±0.9 OUR AVERAGE	Error includes scale factor of 1.9.				
4.6±0.4±0.8	1	FALVARD	88	DM2 $J/\psi \rightarrow \text{hadrons}$	
2.6±0.6	50	¹ GIDAL	81	MRK2 $J/\psi \rightarrow K^+ K^- K^+ K^-$	

NODE=M070R41
NODE=M070R41

¹ Assuming $B(f_0(980) \rightarrow \pi\pi) = 0.78$.

NODE=M070R41;LINKAGE=A

$\Gamma(\phi f_0(980) \rightarrow \phi\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{57}/Γ			
VALUE (units 10^{-3}) 0.182±0.042±0.005	EVTS 19.5 ± 4.5	DOCUMENT ID 1,2 AUBERT	TECN 07AK BABR	COMMENT $10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$

1 Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.

2 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \phi f_0(980) \rightarrow \phi\pi^+\pi^-)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = (1.01 \pm 0.22 \pm 0.08) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\phi f_0(980) \rightarrow \phi\pi^0\pi^0)/\Gamma_{\text{total}}$	Γ_{58}/Γ			
VALUE (units 10^{-3}) 0.171±0.073±0.004	EVTS 7.0 ± 2.8	DOCUMENT ID 1,2 AUBERT	TECN 07AK BABR	COMMENT $10.6 e^+ e^- \rightarrow \pi^0 \pi^0 K^+ K^- \gamma$

1 Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.

2 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \phi f_0(980) \rightarrow \phi\pi^0\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = (0.95 \pm 0.39 \pm 0.10) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\eta\phi f_0(980) \rightarrow \eta\phi\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{59}/Γ			
VALUE (units 10^{-4}) 3.23±0.75±0.73	EVTS 52	DOCUMENT ID ABLIKIM	TECN 08F BES	COMMENT $J/\psi \rightarrow \eta\phi f_0(980)$

$\Gamma(\phi a_0(980)^0 \rightarrow \phi\eta\pi^0)/\Gamma_{\text{total}}$	Γ_{60}/Γ			
VALUE (units 10^{-6}) 5.0±2.7±2.5	EVTS 1	DOCUMENT ID ABLIKIM	TECN 11D BES3	COMMENT $J/\psi \rightarrow \phi\eta\pi^0$

1 Assuming $a_0(980) - f_0(980)$ mixing and isospin breaking via γ^* and $K^* K$ loops.

$\Gamma(\Xi(1530)^0 \Xi^0)/\Gamma_{\text{total}}$	Γ_{61}/Γ			
VALUE (units 10^{-3}) 0.32±0.12±0.07	EVTS 24 ± 9	DOCUMENT ID HENRARD	TECN 87 DM2	COMMENT $e^+ e^-$

$\Gamma(\Sigma(1385)^-\bar{\Sigma}^+ (\text{or c.c.}))/\Gamma_{\text{total}}$	Γ_{62}/Γ			
VALUE (units 10^{-3}) 0.31±0.05 OUR AVERAGE	EVTS 74 ± 8	DOCUMENT ID HENRARD	TECN 87 DM2	COMMENT $e^+ e^- \rightarrow \Sigma^{*-}$

0.30±0.03±0.07	74 ± 8	HENRARD	87	$e^+ e^- \rightarrow \Sigma^{*-}$
0.34±0.04±0.07	77 ± 9	HENRARD	87	$e^+ e^- \rightarrow \Sigma^{*+}$
0.29±0.11±0.10	26	EATON	84	$MRK2 e^+ e^- \rightarrow \Sigma^{*-}$
0.31±0.11±0.11	28	EATON	84	$MRK2 e^+ e^- \rightarrow \Sigma^{*+}$

$\Gamma(\phi f_1(1285))/\Gamma_{\text{total}}$	Γ_{63}/Γ			
VALUE (units 10^{-4}) 2.6±0.5 OUR AVERAGE	EVTS Error includes scale factor of 1.1.	DOCUMENT ID JOUSSET	TECN 90 DM2	COMMENT $J/\psi \rightarrow \phi 2(\pi^+\pi^-)$

3.2±0.6±0.4	JOUSSET	90	DM2	$J/\psi \rightarrow \phi 2(\pi^+\pi^-)$
2.1±0.5±0.4	1 JOUSSET	90	DM2	$J/\psi \rightarrow \phi\eta\pi^+\pi^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.6±0.2±0.1	16 ± 6	BECKER	87	$MRK3 J/\psi \rightarrow \phi K\bar{K}\pi$
-------------	--------	--------	----	--

1 We attribute to the $f_1(1285)$ the signal observed in the $\pi^+\pi^-\eta$ invariant mass distribution at 1297 MeV.

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{64}/Γ			
VALUE (units 10^{-3}) 0.40±0.17±0.03	EVTS 9	DOCUMENT ID 1 AUBERT	TECN 07AU BABR	COMMENT $10.6 e^+ e^- \rightarrow \eta\pi^+\pi^-\gamma$

1 AUBERT 07AU quotes $\Gamma_{ee}^{J/\psi} \cdot B(J/\psi \rightarrow \eta\pi^+\pi^-) \cdot B(\eta \rightarrow 3\pi) = 0.51 \pm 0.22 \pm 0.03$ eV.

$\Gamma(\rho\eta)/\Gamma_{\text{total}}$	Γ_{65}/Γ			
VALUE (units 10^{-3}) 0.193±0.023 OUR AVERAGE	EVTS 299	DOCUMENT ID JOUSSET	TECN 90 DM2	COMMENT $J/\psi \rightarrow \text{hadrons}$

0.194±0.017±0.029	JOUSSET	90	DM2	$J/\psi \rightarrow \text{hadrons}$
0.193±0.013±0.029	COFFMAN	88	MRK3	$e^+ e^- \rightarrow \pi^+\pi^-\eta$

NODE=M070S02
NODE=M070S02

NODE=M070S02;LINKAGE=AU
NODE=M070S02;LINKAGE=BE

NODE=M070S03
NODE=M070S03

NODE=M070S03;LINKAGE=AU
NODE=M070S03;LINKAGE=BE

NODE=M070R08
NODE=M070R08

NODE=M070S75
NODE=M070S75

NODE=M070S75;LINKAGE=AB

NODE=M070S10
NODE=M070S10

NODE=M070R68
NODE=M070R68

OCCUR=2

OCCUR=2

NODE=M070S6
NODE=M070S6

OCCUR=2

NODE=M070S6;LINKAGE=Q

NODE=M070S05
NODE=M070S05

NODE=M070S05;LINKAGE=AU

NODE=M070R22
NODE=M070R22

$\Gamma(\omega\eta'(958))/\Gamma_{\text{total}}$				Γ_{66}/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.182 ± 0.021 OUR AVERAGE				
0.226 ± 0.043	218	1 ABLIKIM	06F BES2	$J/\psi \rightarrow \omega\eta'$
0.18 ± 0.10 - 0.08	6	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$
0.166 ± 0.017 ± 0.019		COFFMAN	88 MRK3	$e^+e^- \rightarrow 3\pi\eta'$
1 Using $B(\eta' \rightarrow \pi^+\pi^-\eta) = (44.3 \pm 1.5)\%$, $B(\eta' \rightarrow \pi^+\pi^-\gamma) = 29.5 \pm 1.0\%$, $B(\eta \rightarrow 2\gamma) = 39.43 \pm 0.26\%$, and $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.1 \pm 0.7)\%$.				

NODE=M070R31
NODE=M070R31

$\Gamma(\omega f_0(980))/\Gamma_{\text{total}}$				Γ_{67}/Γ
<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.41 ± 0.27 ± 0.47	1 AUGUSTIN	89	DM2	$J/\psi \rightarrow 2(\pi^+\pi^-)\pi^0$

NODE=M070R31;LINKAGE=BL

$\Gamma(\rho\eta'(958))/\Gamma_{\text{total}}$				Γ_{68}/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.105 ± 0.018 OUR AVERAGE				
0.083 ± 0.030 ± 0.012	19	JOUSSET	90 DM2	$J/\psi \rightarrow \text{hadrons}$
0.114 ± 0.014 ± 0.016		COFFMAN	88 MRK3	$J/\psi \rightarrow \pi^+\pi^-\eta'$

NODE=M070S27
NODE=M070S27

$\Gamma(a_2(1320)^{\pm}\pi^{\mp})/\Gamma_{\text{total}}$				Γ_{69}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<43	90	BRAUNSCH...	76 DASP	e^+e^-

NODE=M070R42
NODE=M070R42

$\Gamma(K\bar{K}_2^*(1430)+\text{c.c.})/\Gamma_{\text{total}}$				Γ_{70}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<40	90	VANNUCCI	77 MRK1	$e^+e^- \rightarrow K^0\bar{K}_2^{*0}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<66	90	BRAUNSCH...	76 DASP	$e^+e^- \rightarrow K^\pm\bar{K}_2^{\mp}$

NODE=M070R45
NODE=M070R45

$\Gamma(K_1(1270)^{\pm}K^{\mp})/\Gamma_{\text{total}}$				Γ_{71}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<3.0	90	1 BAI	99C BES	e^+e^-

NODE=M070S34
NODE=M070S34

$\Gamma(K_2^*(1430)^0\bar{K}_2^*(1430)^0)/\Gamma_{\text{total}}$				Γ_{72}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<29	90	VANNUCCI	77 MRK1	$e^+e^- \rightarrow \pi^+\pi^-K^+K^-$

NODE=M070R47
NODE=M070R47

$\Gamma(\phi\pi^0)/\Gamma_{\text{total}}$				Γ_{73}/Γ
<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<6.4	90	ABLIKIM	05B BES2	$e^+e^- \rightarrow J/\psi \rightarrow \phi\gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<6.8	90	COFFMAN	88 MRK3	$e^+e^- \rightarrow K^+K^-\pi^0$

NODE=M070R33
NODE=M070R33

$\Gamma(\phi\eta(1405) \rightarrow \phi\eta\pi\pi)/\Gamma_{\text{total}}$				Γ_{74}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.5	90	1 FALVARD	88 DM2	$J/\psi \rightarrow \text{hadrons}$

NODE=M070S23
NODE=M070S23

$\Gamma(\omega f'_2(1525))/\Gamma_{\text{total}}$				Γ_{75}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.2	90	1 VANNUCCI	77 MRK1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<2.8	90	1 FALVARD	88 DM2	$J/\psi \rightarrow \text{hadrons}$
1 Re-evaluated assuming $B(f'_2(1525) \rightarrow K\bar{K}) = 0.713$.				

NODE=M070R29
NODE=M070R29

$\Gamma(\eta\phi(2170) \rightarrow \eta K^*(892)^0\bar{K}^*(892)^0)/\Gamma_{\text{total}}$				Γ_{76}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.52	90	ABLIKIM	10C BES2	$J/\psi \rightarrow \eta K^+\pi^-\pi^+K^-$

NODE=M070R29
NODE=M070R29

$\Gamma(\Sigma(1385)^0 \bar{\Lambda} + \text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{77}/Γ
< 0.82 (CL = 90%)	$<0.2 \times 10^{-3}$ (CL = 90%) OUR 2012 BEST LIMIT]				
< 0.82	90	ABLIKIM	13F	BES3 $J/\psi \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$	I
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<20	90	HENRARD	87	DM2 e^+e^-	

 $\Gamma(\Delta(1232)^+\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{78}/Γ
<0.1	90	HENRARD	87	DM2 e^+e^-	

 $\Gamma(\Lambda(1520)\bar{\Lambda} + \text{c.c.} \rightarrow \gamma\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{79}/Γ
<4.1	90	ABLIKIM	12B	BES3 $J/\psi \rightarrow \Lambda\bar{\Lambda}\gamma$	I

 $\Gamma(\Theta(1540)\bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{80}/Γ
<1.1	90	BAI	04G	BES2 e^+e^-	

 $\Gamma(\Theta(1540)K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{81}/Γ
<2.1	90	BAI	04G	BES2 e^+e^-	

 $\Gamma(\Theta(1540)K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{82}/Γ
<1.6	90	BAI	04G	BES2 e^+e^-	

 $\Gamma(\bar{\Theta}(1540)K^+ n \rightarrow K_S^0 \bar{p} K^+ n)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{83}/Γ
<5.6	90	BAI	04G	BES2 e^+e^-	

 $\Gamma(\bar{\Theta}(1540)K_S^0 p \rightarrow K_S^0 p K^- \bar{n})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{84}/Γ
<1.1	90	BAI	04G	BES2 e^+e^-	

 $\Gamma(\Sigma^0 \bar{\Lambda})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{85}/Γ
<0.9	90	HENRARD	87	DM2 e^+e^-	

STABLE HADRONS $\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{86}/Γ
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4.1 ± 0.5 OUR AVERAGE				Error includes scale factor of 2.4. See the ideogram below.	
5.46 ± 0.34 ± 0.14	4990	¹ AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow 2(\pi^+\pi^-)\pi^0\gamma$	
3.25 ± 0.49	46055	AUGUSTIN	89 DM2	$J/\psi \rightarrow 2(\pi^+\pi^-)\pi^0$	
3.17 ± 0.42	147	FRANKLIN	83 MRK2	$e^+e^- \rightarrow \text{hadrons}$	
3.64 ± 0.52	1500	BURMESTER	77D PLUT	e^+e^-	
4 ± 1	675	JEAN-MARIE	76 MRK1	e^+e^-	

¹AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow 2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = 0.303 \pm 0.005 \pm 0.018 \text{ keV}$ which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02 \text{ keV}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

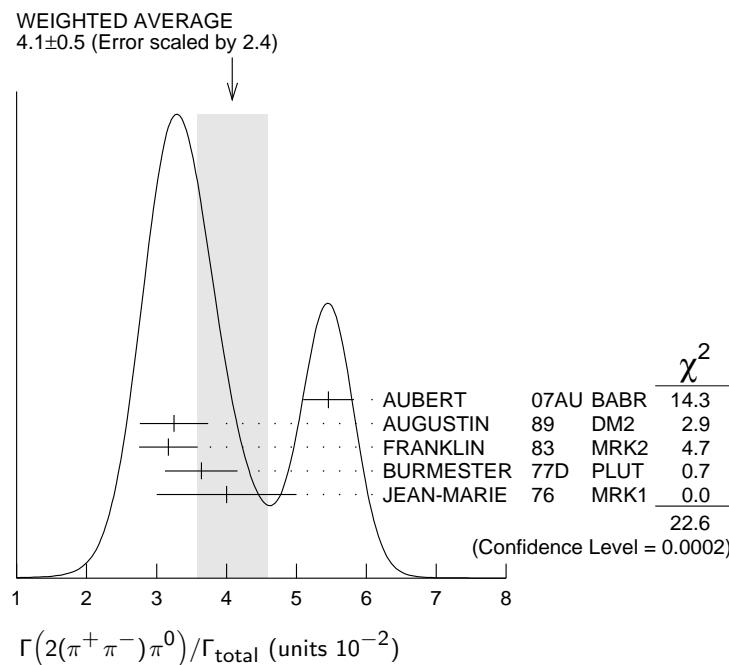
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NODE=M070S51NODE=M070S12
NODE=M070S12

NODE=M070307

NODE=M070R9

NODE=M070R9

NODE=M070R9;LINKAGE=AU



$\Gamma(\omega\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-)\pi^0)$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.3 ¹ JEAN-MARIE 76 MRK1 e^+e^-

¹ Final state $(\pi^+\pi^-)\pi^0$ under the assumption that $\pi\pi$ is isospin 0.

Γ_{13}/Γ_{86}

NODE=M070R25
NODE=M070R25

$\Gamma(3(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	Γ_{87}/Γ
0.029±0.006 OUR AVERAGE				
0.028±0.009	11	FRANKLIN 83	MRK2 $e^+e^- \rightarrow \text{hadrons}$	
0.029±0.007	181	JEAN-MARIE 76	MRK1 e^+e^-	

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

Γ_{88}/Γ

NODE=M070R7
NODE=M070R7

NEW

21.1 ± 0.7 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.
[(20.7 ± 1.2) × 10⁻³ OUR 2012 AVERAGE Scale factor = 1.6]

21.37±0.04 ^{+0.64} _{-0.62}	1.8M	1,2 ABLIKIM	12H BES3 $e^+e^- \rightarrow J/\psi$
23.0 ± 2.0 ± 0.4	256	³ AUBERT	07AU BABR 10.6 $e^+e^- \rightarrow J/\psi\pi^+\pi^-\gamma$
21.8 ± 1.9		4,5 AUBERT,B	04N BABR 10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
21.84±0.05±2.01	220k	1,5 BAI	04H BES e^+e^-
20.91±0.21±1.16		5,6 BAI	04H BES e^+e^-
15 ± 2	168	FRANKLIN 83	MRK2 e^+e^-

1 From $J/\psi \rightarrow \pi^+\pi^-\pi^0$ events directly.

2 The quoted systematic error includes a contribution of 1.23% (added in quadrature) from the uncertainty on the number of J/ψ events.

3 AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] = (18.6 \pm 1.2 \pm 1.1) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}} = 0.807 \pm 0.014$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

4 From the ratio of $\Gamma(e^+e^-) B(\pi^+\pi^-\pi^0)$ and $\Gamma(e^+e^-) B(\mu^+\mu^-)$ (AUBERT 04).

5 Mostly $\rho\pi$, see also $\rho\pi$ subsection.

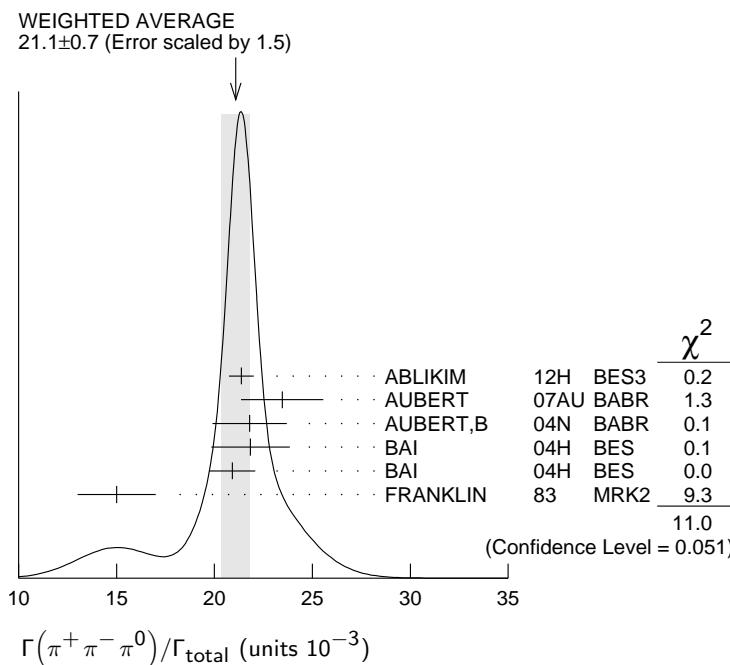
6 Obtained comparing the rates for $\pi^+\pi^-\pi^0$ and $\mu^+\mu^-$, using J/ψ events produced via $\psi(2S) \rightarrow \pi^+\pi^- J/\psi$ and with $B(J/\psi \rightarrow \mu^+\mu^-) = 5.88 \pm 0.10\%$.

OCCUR=2

NODE=M070R;LINKAGE=BA
NODE=M070R7;LINKAGE=AB

NODE=M070R7;LINKAGE=AU

NODE=M070R;LINKAGE=AU
NODE=M070R;LINKAGE=BU
NODE=M070R;LINKAGE=BI



$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{89}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.79±0.29 OUR AVERAGE				Error includes scale factor of 2.2.
1.93±0.14±0.05	768	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \pi^0 \gamma$
1.2 ± 0.3	309	VANNUCCI	77 MRK1	$e^+ e^-$

¹AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0 K^+ K^-)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = 0.1070 \pm 0.0043 \pm 0.0064$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
90±30	13	JEAN-MARIE	76	MRK1 $e^+ e^-$

$\Gamma(\pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}$ Γ_{91}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
6.6±0.5 OUR AVERAGE				
6.5±0.4±0.2	1.6k	¹ AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow \pi^+\pi^- K^+ K^- \gamma$
7.2±2.3	205	VANNUCCI	77 MRK1	$e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
6.1±0.7±0.2	233	² AUBERT	05D BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$

¹AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (36.3 \pm 1.3 \pm 2.1) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

²Superseded by AUBERT 07AK. AUBERT 05D reports $[\Gamma(J/\psi(1S) \rightarrow \pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (33.6 \pm 2.7 \pm 2.7) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^+\pi^-K^+K^-\eta)/\Gamma_{\text{total}}$ Γ_{92}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.84±0.28±0.05	73	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \eta \gamma$

¹AUBERT 07AU reports $[\Gamma(J/\psi(1S) \rightarrow \pi^+\pi^-K^+K^-\eta)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (10.2 \pm 1.3 \pm 0.8) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M070R18
NODE=M070R18

NODE=M070R18;LINKAGE=AU

NODE=M070R12
NODE=M070R12

NODE=M070R16
NODE=M070R16

NODE=M070R16;LINKAGE=BE

NODE=M070R16;LINKAGE=AU

NODE=M070S04
NODE=M070S04

NODE=M070S04;LINKAGE=AU

$\Gamma(\pi^0\pi^0K^+K^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
2.45±0.31±0.06	203 ± 16	1 AUBERT 07AK	BABR	$10.6 e^+e^- \rightarrow \pi^0\pi^0K^+K^-\gamma$ 1 AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow \pi^0\pi^0K^+K^-)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = (13.6 \pm 1.1 \pm 1.3) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 Γ_{93}/Γ NODE=M070S01
NODE=M070S01 $\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
61 ± 10 OUR AVERAGE				
55.2 ± 12.0	25	FRANKLIN	83	$MRK2 e^+e^- \rightarrow K^+K^-\pi^0$
78.0 ± 21.0	126	VANNUCCI	77	$MRK1 e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$

 Γ_{94}/Γ NODE=M070R15
NODE=M070R15 $\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
3.57±0.30 OUR AVERAGE				

[(3.55 ± 0.23) × 10⁻³ OUR 2012 AVERAGE]

3.53 ± 0.12 ± 0.29	1107	1 ABLIKIM	05H BES2	$e^+e^- \rightarrow \psi(2S) \rightarrow J/\psi\pi^+\pi^-, J/\psi \rightarrow 2(\pi^+\pi^-)$
4.0 ± 1.0	76	JEAN-MARIE	76 MRK1	e^+e^-

• • • We do not use the following data for averages, fits, limits, etc. • • •

3.51 ± 0.34 ± 0.09	270	2 AUBERT	05D BABR	$10.6 e^+e^- \rightarrow 2(\pi^+\pi^-)\gamma$
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1 Computed using $B(J/\psi \rightarrow \mu^+\mu^-) = 0.0588 \pm 0.0010$.2 AUBERT 05D reports $[\Gamma(J/\psi(1S) \rightarrow 2(\pi^+\pi^-))/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = (19.5 \pm 1.4 \pm 1.3) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value. Superseded by LEES 12E. $\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
43 ± 4 OUR AVERAGE				
43.0 ± 2.9 ± 2.8	496	1 AUBERT	06D BABR	$10.6 e^+e^- \rightarrow 3(\pi^+\pi^-)\gamma$

40 ± 20	32	JEAN-MARIE	76 MRK1	e^+e^-
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1 Using $\Gamma(J/\psi \rightarrow e^+e^-) = 5.52 \pm 0.14 \pm 0.04$ keV. Γ_{96}/Γ NODE=M070R10
NODE=M070R10 $\Gamma(2(\pi^+\pi^-\pi^0))/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.62±0.09±0.19	761	1 AUBERT	06D BABR	$10.6 e^+e^- \rightarrow 2(\pi^+\pi^-\pi^0)\gamma$

1 Using $\Gamma(J/\psi \rightarrow e^+e^-) = 5.52 \pm 0.14 \pm 0.04$ keV. Γ_{97}/Γ NODE=M070R69
NODE=M070R69 $\Gamma(2(\pi^+\pi^-)\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
2.29±0.24 OUR AVERAGE				
2.35 ± 0.39 ± 0.20	85	1 AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow 2(\pi^+\pi^-)\eta\gamma$

2.26 ± 0.08 ± 0.27	4839	ABLIKIM	05C BES2	$e^+e^- \rightarrow 2(\pi^+\pi^-)\eta$
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1 AUBERT 07AU quotes $\Gamma_{ee}^{J/\psi} \cdot B(J/\psi \rightarrow 2(\pi^+\pi^-)\eta) \cdot B(\eta \rightarrow \gamma\gamma) = 5.16 \pm 0.85 \pm 0.39$ eV. Γ_{98}/Γ NODE=M070S42
NODE=M070S42 $\Gamma(3(\pi^+\pi^-)\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
7.24±0.96±1.11	616	ABLIKIM	05C BES2	$e^+e^- \rightarrow 3(\pi^+\pi^-)\eta$

 Γ_{99}/Γ NODE=M070S43
NODE=M070S43 $\Gamma(p\bar{p})/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
2.120±0.029 OUR AVERAGE				

[(2.17 ± 0.07) × 10⁻³ OUR 2012 AVERAGE]

2.112 ± 0.004 ± 0.031	314k	ABLIKIM	12C BES3	e^+e^-
2.15 ± 0.16 ± 0.06	317	1 WU	06 BELL	$B^+ \rightarrow p\bar{p}K^+$
2.26 ± 0.01 ± 0.14	63316	BAI	04E BES2	$e^+e^- \rightarrow J/\psi$
1.97 ± 0.22	99	BALDINI	98 FENI	e^+e^-
1.91 ± 0.04 ± 0.30		PALLIN	87 DM2	e^+e^-

 Γ_{100}/Γ NODE=M070R50
NODE=M070R50

NEW

2.16 $\pm 0.07 \pm 0.15$	1420	EATON	84	MRK2	$e^+ e^-$
2.5 ± 0.4	133	BRANDELIK	79c	DASP	$e^+ e^-$
2.0 ± 0.5		BESCH	78	BONA	$e^+ e^-$
2.2 ± 0.2	331	² PERUZZI	78	MRK1	$e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.0 ± 0.3	48	ANTONELLI	93	SPEC	$e^+ e^-$
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¹ WU 06 reports $[\Gamma(J/\psi(1S) \rightarrow p\bar{p})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow J/\psi(1S)K^+)] = (2.21 \pm 0.13 \pm 0.10) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow J/\psi(1S)K^+) = (1.028 \pm 0.031) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Assuming angular distribution $(1+\cos^2\theta)$.

$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$

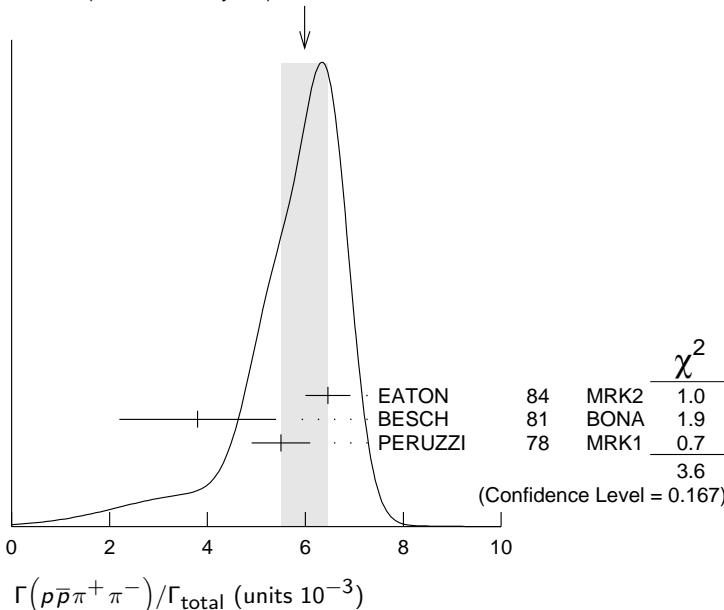
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{101}/Γ
1.19 ± 0.08 OUR AVERAGE	Error includes scale factor of 1.1.				
1.33 $\pm 0.02 \pm 0.11$	11k	ABLIKIM	09B	BES2	$e^+ e^-$
1.13 $\pm 0.09 \pm 0.09$	685	EATON	84	MRK2	$e^+ e^-$
1.4 ± 0.4		BRANDELIK	79c	DASP	$e^+ e^-$
1.00 ± 0.15	109	PERUZZI	78	MRK1	$e^+ e^-$

$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{102}/Γ
6.0 ± 0.5 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.				
6.46 $\pm 0.17 \pm 0.43$	1435	EATON	84	MRK2	$e^+ e^-$
3.8 ± 1.6	48	BESCH	81	BONA	$e^+ e^-$
5.5 ± 0.6	533	PERUZZI	78	MRK1	$e^+ e^-$

WEIGHTED AVERAGE

6.0 ± 0.5 (Error scaled by 1.3)



$\Gamma(p\bar{p}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

Including $p\bar{p}\pi^+\pi^-\gamma$ and excluding ω, η, η'

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{103}/Γ
2.3 ± 0.9 OUR AVERAGE	Error includes scale factor of 1.9.				
3.36 $\pm 0.65 \pm 0.28$	364	EATON	84	MRK2	$e^+ e^-$
1.6 ± 0.6	39	PERUZZI	78	MRK1	$e^+ e^-$

$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{104}/Γ
2.00 ± 0.12 OUR AVERAGE					
1.91 $\pm 0.02 \pm 0.17$	13k	¹ ABLIKIM	09	BES2	$e^+ e^-$
2.03 $\pm 0.13 \pm 0.15$	826	EATON	84	MRK2	$e^+ e^-$
2.5 ± 1.2		BRANDELIK	79c	DASP	$e^+ e^-$
2.3 ± 0.4	197	PERUZZI	78	MRK1	$e^+ e^-$

¹ From the combination of $p\bar{p}\eta \rightarrow p\bar{p}\gamma\gamma$ and $p\bar{p}\eta \rightarrow p\bar{p}\pi^+\pi^-\pi^0$ channels.

NODE=M070R50;LINKAGE=WU

NODE=M070R50;LINKAGE=A

NODE=M070R52
NODE=M070R52

NODE=M070R54
NODE=M070R54

NODE=M070R55
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NODE=M070R55

NODE=M070R56
NODE=M070R56

NODE=M070R56;LINKAGE=AB

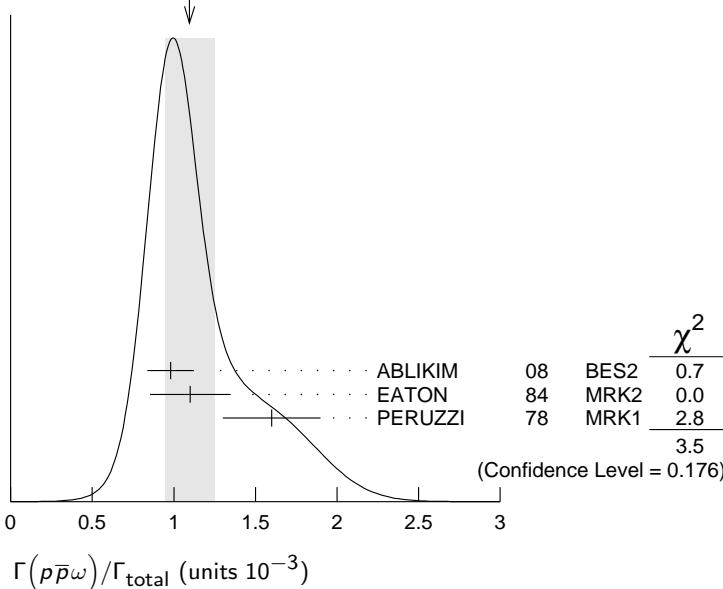
$\Gamma(p\bar{p}\rho)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{105}/Γ
<0.31	90	EATON	84	MRK2 $e^+ e^- \rightarrow \text{hadrons} \gamma$	NODE=M070R57 NODE=M070R57

 $\Gamma(p\bar{p}\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{106}/Γ
1.10 ± 0.15 OUR AVERAGE				Error includes scale factor of 1.3. See the ideogram below.	
0.98 ± 0.03 ± 0.14	2449	ABLIKIM	08	BES2 $e^+ e^-$	
1.10 ± 0.17 ± 0.18	486	EATON	84	MRK2 $e^+ e^-$	
1.6 ± 0.3	77	PERUZZI	78	MRK1 $e^+ e^-$	

WEIGHTED AVERAGE
1.10 ± 0.15 (Error scaled by 1.3)

 $\Gamma(p\bar{p}\eta'(958))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{107}/Γ
0.21 ± 0.04 OUR AVERAGE					NODE=M070R59 NODE=M070R59
0.200 ± 0.023 ± 0.028	265 ± 31	1 ABLIKIM	09	BES2 $e^+ e^-$	
0.68 ± 0.23 ± 0.17	19	EATON	84	MRK2 $e^+ e^-$	
1.8 ± 0.6	19	PERUZZI	78	MRK1 $e^+ e^-$	

¹ From the combination of $p\bar{p}\eta' \rightarrow p\bar{p}\pi^+\pi^-\eta$ and $p\bar{p}\eta' \rightarrow p\bar{p}\gamma\rho^0$ channels.

 $\Gamma(p\bar{p}\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{108}/Γ
0.45 ± 0.13 ± 0.07		FALVARD	88	DM2 $J/\psi \rightarrow \text{hadrons}$	NODE=M070S22 NODE=M070S22

 $\Gamma(n\bar{n})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{109}/Γ
2.09 ± 0.16 OUR AVERAGE					NODE=M070R64 NODE=M070R64

[$(0.22 \pm 0.04) \times 10^{-2}$ OUR 2012 AVERAGE]

2.07 ± 0.01 ± 0.17	36k	ABLIKIM	12C	BES3 $e^+ e^-$	
2.31 ± 0.49	79	BALDINI	98	FENI $e^+ e^-$	
1.8 ± 0.9		BESCH	78	BONA $e^+ e^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.90 ± 0.55	40	ANTONELLI	93	SPEC $e^+ e^-$	

 $\Gamma(n\bar{n}\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{110}/Γ
3.8 ± 3.6	5	BESCH	81	BONA $e^+ e^-$	NODE=M070R65 NODE=M070R65

 $\Gamma(\Sigma^+ \bar{\Sigma}^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{111}/Γ
1.50 ± 0.10 ± 0.22	399	ABLIKIM	080	BES2 $e^+ e^- \rightarrow J/\psi$	NODE=M070S09 NODE=M070S09

$\Gamma(\Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{112}/Γ
1.29 ± 0.09 OUR AVERAGE					
1.15 ± 0.24 ± 0.03		¹ AUBERT	07BD BABR	$10.6 e^+ e^- \rightarrow \Sigma^0 \bar{\Sigma}^0 \gamma$	
1.33 ± 0.04 ± 0.11	1779	ABLIKIM	06 BES2	$J/\psi \rightarrow \Sigma^0 \bar{\Sigma}^0$	
1.06 ± 0.04 ± 0.23	884 ± 30	PALLIN	87 DM2	$e^+ e^- \rightarrow \Sigma^0 \bar{\Sigma}^0$	
1.58 ± 0.16 ± 0.25	90	EATON	84 MRK2	$e^+ e^- \rightarrow \Sigma^0 \bar{\Sigma}^0$	
1.3 ± 0.4	52	PERUZZI	78 MRK1	$e^+ e^- \rightarrow \Sigma^0 \bar{\Sigma}^0$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.4 ± 2.6	3	BESCH	81 BONA	$e^+ e^- \rightarrow \Sigma^+ \bar{\Sigma}^-$	
-----------	---	-------	---------	---	--

¹AUBERT 07BD reports $[\Gamma(J/\psi(1S) \rightarrow \Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (6.4 \pm 1.2 \pm 0.6) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2(\pi^+ \pi^-) K^+ K^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{113}/Γ
47 ± 7 OUR AVERAGE Error includes scale factor of 1.3.					
49.8 ± 4.2 ± 3.4	205	¹ AUBERT	06D BABR	$10.6 e^+ e^- \rightarrow \omega K^+ K^- 2(\pi^+ \pi^-) \gamma$	
31 ± 13	30	VANNUCCI	77 MRK1	$e^+ e^-$	

¹Using $\Gamma(J/\psi \rightarrow e^+ e^-) = 5.52 \pm 0.14 \pm 0.04$ keV.

 $\Gamma(p \bar{n} \pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{114}/Γ
2.12 ± 0.09 OUR AVERAGE					
2.36 ± 0.02 ± 0.21	59k	ABLIKIM	06K BES2	$J/\psi \rightarrow p \pi^- \bar{n}$	
2.47 ± 0.02 ± 0.24	55k	ABLIKIM	06K BES2	$J/\psi \rightarrow \bar{p} \pi^+ n$	
2.02 ± 0.07 ± 0.16	1288	EATON	84 MRK2	$e^+ e^- \rightarrow p \pi^-$	
1.93 ± 0.07 ± 0.16	1191	EATON	84 MRK2	$e^+ e^- \rightarrow \bar{p} \pi^+$	
1.7 ± 0.7	32	BESCH	81 BONA	$e^+ e^- \rightarrow p \pi^-$	
1.6 ± 1.2	5	BESCH	81 BONA	$e^+ e^- \rightarrow \bar{p} \pi^+$	
2.16 ± 0.29	194	PERUZZI	78 MRK1	$e^+ e^- \rightarrow p \pi^-$	
2.04 ± 0.27	204	PERUZZI	78 MRK1	$e^+ e^- \rightarrow \bar{p} \pi^+$	

 $\Gamma(\Xi^- \bar{\Xi}^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{118}/Γ
0.86 ± 0.11 OUR AVERAGE Error includes scale factor of 1.2. [(0.85 ± 0.16) × 10 ⁻³ OUR 2012 AVERAGE Scale factor = 1.5]					
0.90 ± 0.03 ± 0.18	961 ± 35	ABLIKIM	12P BES2	$J/\psi \rightarrow \Xi^- \bar{\Xi}^+$	
0.70 ± 0.06 ± 0.12	132 ± 11	HENRARD	87 DM2	$e^+ e^- \rightarrow \Xi^- \bar{\Xi}^+$	
1.14 ± 0.08 ± 0.20	194	EATON	84 MRK2	$e^+ e^- \rightarrow \Xi^- \bar{\Xi}^+$	
1.4 ± 0.5	51	PERUZZI	78 MRK1	$e^+ e^- \rightarrow \Xi^- \bar{\Xi}^+$	

 $\Gamma(\Lambda \bar{\Lambda})/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{119}/Γ
1.61 ± 0.15 OUR AVERAGE Error includes scale factor of 1.9. See the ideogram below.					
1.93 ± 0.21 ± 0.05		¹ AUBERT	07BD BABR	$10.6 e^+ e^- \rightarrow \Lambda \bar{\Lambda} \gamma$	
2.03 ± 0.03 ± 0.15	8887	ABLIKIM	06 BES2	$J/\psi \rightarrow \Lambda \bar{\Lambda}$	
1.9 ± 0.5 ± 0.1	46	² WU	06 BELL	$B^+ \rightarrow \Lambda \bar{\Lambda} K^+$	
1.08 ± 0.06 ± 0.24	631	BAI	98G BES	$e^+ e^-$	
1.38 ± 0.05 ± 0.20	1847	PALLIN	87 DM2	$e^+ e^-$	
1.58 ± 0.08 ± 0.19	365	EATON	84 MRK2	$e^+ e^-$	
2.6 ± 1.6	5	BESCH	81 BONA	$e^+ e^-$	
1.1 ± 0.2	196	PERUZZI	78 MRK1	$e^+ e^-$	

¹AUBERT 07BD reports $[\Gamma(J/\psi(1S) \rightarrow \Lambda \bar{\Lambda})/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+ e^-)] = (10.7 \pm 0.9 \pm 0.7) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+ e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

²WU 06 reports $[\Gamma(J/\psi(1S) \rightarrow \Lambda \bar{\Lambda})/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow J/\psi(1S) K^+)] = (2.00^{+0.34}_{-0.29} \pm 0.34) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow J/\psi(1S) K^+) = (1.028 \pm 0.031) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M070R63
NODE=M070R63

NODE=M070R63;LINKAGE=AU

NODE=M070R17
NODE=M070R17

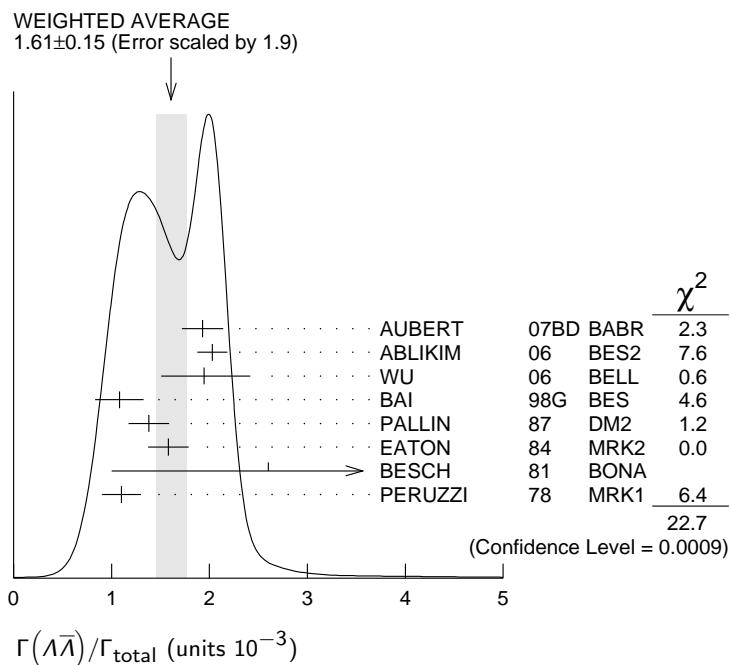
NODE=M070R62
NODE=M070R62

NEW

NODE=M070R60
NODE=M070R60

NODE=M070R60;LINKAGE=AU

NODE=M070R60;LINKAGE=WU

 $\Gamma(\Lambda\bar{\Lambda})/\Gamma(p\bar{p})$

VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_{119}/\Gamma_{100}$
$0.90^{+0.15}_{-0.14} \pm 0.10$	¹ WU	06	BELL $B^+ \rightarrow p\bar{p}K^+, \Lambda\bar{\Lambda}K^+$	

¹ Not independent of other $J/\psi \rightarrow \Lambda\bar{\Lambda}, p\bar{p}$ branching ratios reported by WU 06.

 $\Gamma(\Lambda\bar{\Sigma}^-\pi^+ (\text{or c.c.}))/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{120}/Γ
0.83 ± 0.07 OUR AVERAGE				Error includes scale factor of 1.2.	
0.770±0.051±0.083	335	¹ ABLIKIM	07H BES2	$e^+ e^- \rightarrow \bar{\Lambda}\Sigma^+\pi^-$	
0.747±0.056±0.076	254	¹ ABLIKIM	07H BES2	$e^+ e^- \rightarrow \bar{\Lambda}\bar{\Sigma}^-\pi^+$	
0.90 ± 0.06 ± 0.16	225 ± 15	HENRARD	87 DM2	$e^+ e^- \rightarrow \bar{\Lambda}\Sigma^+\pi^-$	
1.11 ± 0.06 ± 0.20	342 ± 18	HENRARD	87 DM2	$e^+ e^- \rightarrow \bar{\Lambda}\bar{\Sigma}^-\pi^+$	
1.53 ± 0.17 ± 0.38	135	EATON	84 MRK2	$e^+ e^- \rightarrow \bar{\Lambda}\Sigma^+\pi^-$	
1.38 ± 0.21 ± 0.35	118	EATON	84 MRK2	$e^+ e^- \rightarrow \bar{\Lambda}\bar{\Sigma}^-\pi^+$	

¹ Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\Sigma^+ \rightarrow \pi^0 p) = 51.6\%$.

 $\Gamma(pK^-\bar{\Lambda})/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{121}/Γ
$0.89 \pm 0.07 \pm 0.14$	307	EATON	84	MRK2 $e^+ e^-$	

 $\Gamma(2(K^+K^-))/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{122}/Γ
0.76 ± 0.09 OUR AVERAGE					
0.74±0.09±0.02	156 ± 15	¹ AUBERT	07AK BABR	$10.6 e^+ e^- \rightarrow 2(K^+K^-)\gamma$	
$1.4^{+0.5}_{-0.4} \pm 0.2$	$11.0^{+4.3}_{-3.5}$	² HUANG	03 BELL	$B^+ \rightarrow 2(K^+K^-) K^+$	
0.7 ± 0.3		VANNUCCI	77 MRK1	$e^+ e^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.72±0.17±0.02 38 ³ AUBERT 05D BABR $10.6 e^+ e^- \rightarrow 2(K^+K^-)\gamma$

¹ AUBERT 07AK reports $[\Gamma(J/\psi(1S) \rightarrow 2(K^+K^-))/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = (4.11 \pm 0.39 \pm 0.30) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Using $B(B^+ \rightarrow J/\psi K^+) = (1.01 \pm 0.05) \times 10^{-3}$.

³ Superseded by AUBERT 07AK. AUBERT 05D reports $[\Gamma(J/\psi(1S) \rightarrow 2(K^+K^-))/\Gamma_{\text{total}}] \times [\Gamma(J/\psi(1S) \rightarrow e^+e^-)] = (4.0 \pm 0.7 \pm 0.6) \times 10^{-3}$ keV which we divide by our best value $\Gamma(J/\psi(1S) \rightarrow e^+e^-) = 5.55 \pm 0.14 \pm 0.02$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M070R79
NODE=M070R79

NODE=M070R79;LINKAGE=WU

NODE=M070R71
NODE=M070R71

OCCUR=2

OCCUR=2

OCCUR=2

NODE=M070R71;LINKAGE=AB

NODE=M070R72
NODE=M070R72

NODE=M070R19
NODE=M070R19

NODE=M070R19;LINKAGE=BE

NODE=M070R19;LINKAGE=CC
NODE=M070R19;LINKAGE=AU

$\Gamma(pK^-\bar{\Sigma}^0)/\Gamma_{\text{total}}$						Γ_{123}/Γ	NODE=M070R73 NODE=M070R73
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
$0.29 \pm 0.06 \pm 0.05$	90	EATON	84	MRK2 e^+e^-			
$\Gamma(K^+K^-)/\Gamma_{\text{total}}$						Γ_{124}/Γ	NODE=M070R13 NODE=M070R13
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			NEW
$2.70 \pm 0.17 \text{ OUR AVERAGE}$							
$[(2.37 \pm 0.31) \times 10^{-4} \text{ OUR 2012 AVERAGE}]$							
2.86 $\pm 0.09 \pm 0.19$	1k	¹ METREVELI	12	$\psi(2S) \rightarrow \pi^+\pi^-K^+K^-$			
2.39 $\pm 0.24 \pm 0.22$	107	BALTRUSAIT..85D	MRK3	e^+e^-			
2.2 ± 0.9	6	BRANDELIK	79C	DASP e^+e^-			
• • • Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.							NODE=M070R13;LINKAGE=ME
$\Gamma(K_S^0 K_L^0)/\Gamma_{\text{total}}$						Γ_{125}/Γ	NODE=M070R75 NODE=M070R75
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			NEW
$2.1 \pm 0.4 \text{ OUR AVERAGE}$				Error includes scale factor of 3.2. $[(1.46 \pm 0.26) \times 10^{-4}$ OUR 2012 AVERAGE Scale factor = 2.7]			
2.62 $\pm 0.15 \pm 0.14$	0.3k	¹ METREVELI	12	$\psi(2S) \rightarrow \pi^+\pi^-K_S^0 K_L^0$			
1.82 $\pm 0.04 \pm 0.13$	2.1k	² BAI	04A	BES2 $J/\psi \rightarrow K_S^0 K_L^0 \rightarrow \pi^+\pi^-X$			
• • • We do not use the following data for averages, fits, limits, etc. • • •							
1.18 $\pm 0.12 \pm 0.18$		JOUSSET	90	DM2 $J/\psi \rightarrow \text{hadrons}$			
1.01 $\pm 0.16 \pm 0.09$	74	BALTRUSAIT..85D	MRK3	e^+e^-			
• • • Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.							NODE=M070R75;LINKAGE=ME
• • • Using $B(K_S^0 \rightarrow \pi^+\pi^-) = 0.6868 \pm 0.0027$.							NODE=M070R;LINKAGE=HZ
$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$						Γ_{126}/Γ	NODE=M070S78 NODE=M070S78
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
$4.30 \pm 0.13 \pm 0.99$	2.4k	ABLIKIM	12P	BES2 J/ψ			
$\Gamma(\Lambda\bar{\Lambda}\eta)/\Gamma_{\text{total}}$						Γ_{127}/Γ	NODE=M070R07 NODE=M070R07
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			NEW
$16.2 \pm 1.7 \text{ OUR AVERAGE}$							
$[(2.6 \pm 0.7) \times 10^{-4} \text{ OUR 2012 AVERAGE}]$							
15.7 $\pm 0.80 \pm 1.54$	454	¹ ABLIKIM	13F	BES3 $J/\psi \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$			
26.2 $\pm 6.0 \pm 4.4$	44	² ABLIKIM	07H	BES2 $e^+e^- \rightarrow \psi(2S)$			
• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\eta \rightarrow \gamma\gamma) = 39.31\%$.							NODE=M070R07;LINKAGE=AL
• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\eta \rightarrow \gamma\gamma) = 39.4\%$.							NODE=M070R07;LINKAGE=AB
$\Gamma(\Lambda\bar{\Lambda}\pi^0)/\Gamma_{\text{total}}$						Γ_{128}/Γ	NODE=M070S11 NODE=M070S11
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NEW
$3.8 \pm 0.4 \text{ OUR AVERAGE}$					$[(0.22 \pm 0.06) \times 10^{-3} \text{ OUR 2007 AVERAGE}]$		
$3.78 \pm 0.27 \pm 0.30$	323	¹ ABLIKIM	13F	BES3 $J/\psi \rightarrow p\bar{p}\pi^+\pi^-\gamma\gamma$			
• • • We do not use the following data for averages, fits, limits, etc. • • •							
< 6.4	90	² ABLIKIM	07H	BES2 $e^+e^- \rightarrow \psi(2S)$			
23 $\pm 7 \pm 8$	11	BAI	98G	BES e^+e^-			
22 $\pm 5 \pm 5$	19	HENRARD	87	DM2 e^+e^-			
• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\pi^0 \rightarrow \gamma\gamma) = 98.8\%$.							NODE=M070S11;LINKAGE=AL
• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$.							NODE=M070S11;LINKAGE=AB
$\Gamma(\bar{\Lambda}nK_S^0 + \text{c.c.})/\Gamma_{\text{total}}$						Γ_{129}/Γ	NODE=M070S56 NODE=M070S56
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			
$6.46 \pm 0.20 \pm 1.07$	1058	¹ ABLIKIM	08C	BES2 $e^+e^- \rightarrow J/\psi$			
• • • Using $B(\bar{\Lambda} \rightarrow \bar{p}\pi^+) = 63.9\%$ and $B(K_S^0 \rightarrow \pi^+\pi^-) = 69.2\%$.							NODE=M070S56;LINKAGE=AB
$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$						Γ_{130}/Γ	NODE=M070R6 NODE=M070R6
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>			NEW
$1.47 \pm 0.14 \text{ OUR AVERAGE}$							
$[(1.47 \pm 0.23) \times 10^{-4} \text{ OUR 2012 AVERAGE}]$							
1.47 $\pm 0.13 \pm 0.13$	140	¹ METREVELI	12	$\psi(2S) \rightarrow 2(\pi^+\pi^-)$			
1.58 $\pm 0.20 \pm 0.15$	84	BALTRUSAIT..85D	MRK3	e^+e^-			
1.0 ± 0.5	5	BRANDELIK	78B	DASP e^+e^-			
1.6 ± 1.6	1	VANNUCCI	77	MRK1 e^+e^-			
• • • Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.							NODE=M070R6;LINKAGE=ME

$\Gamma(\Lambda\bar{\Sigma} + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	EVTS
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 2.83 ± 0.23 OUR AVERAGE

$2.74 \pm 0.24 \pm 0.22$	234 ± 21	1 ABLIKIM
$2.92 \pm 0.22 \pm 0.24$	308 ± 24	2 ABLIKIM

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.15	90	PERUZZI	78	MRK1	$e^+ e^- \rightarrow \Lambda X$
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¹ ABLIKIM 12B quotes $B(J/\psi \rightarrow \Lambda\bar{\Sigma}^0)$ which we multiply by 2.

² ABLIKIM 12B quotes $B(J/\psi \rightarrow \bar{\Lambda}\Sigma^0)$ which we multiply by 2.

 Γ_{131}/Γ

NODE=M070R61

NODE=M070R61

OCCUR=2

 $\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS
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<0.01	95	1 BAI
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.052	90	1 BALTRUSAIT..85C	MRK3	$e^+ e^-$
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¹ Forbidden by CP.

 Γ_{132}/Γ

NODE=M070R14

NODE=M070R14

NODE=M070R14;LINKAGE=C

NODE=M070310

RADIATIVE DECAYS $\Gamma(3\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	EVTS
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 11.6 ± 2.2 OUR AVERAGE

$[(12 \pm 4) \times 10^{-6}$ OUR 2012 AVERAGE]

$11.3 \pm 1.8 \pm 2.0$	113 ± 18	ABLIKIM	13I	BES3	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$
$12 \pm 3 \pm 2$	$24.2^{+7.2}_{-6.0}$	ADAMS	08	CLEO	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<55	90	PARTRIDGE	80	CBAL	$e^+ e^-$
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 Γ_{133}/Γ

NODE=M070R81

NODE=M070R81

NEW

 $\Gamma(4\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	EVTS
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<9	90	ADAMS
----	----	-------

08	CLEO	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$
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 Γ_{134}/Γ

NODE=M070S06

NODE=M070S06

 $\Gamma(5\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	EVTS
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<15	90	ADAMS
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08	CLEO	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$
----	------	---

 Γ_{135}/Γ

NODE=M070S07

NODE=M070S07

 $\Gamma(\gamma\eta_c(1S))/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS
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1.7 ± 0.4 OUR AVERAGE Error includes scale factor of 1.6. $[(1.7 \pm 0.4) \times 10^{-2}$ OUR 2012 AVERAGE Scale factor = 1.6]

2.04 $\pm 0.32 \pm 0.02$	1 MITCHELL	09 CLEO	$e^+ e^- \rightarrow \gamma X$
1.27 ± 0.36	GAISER	86 CBAL	$J/\psi \rightarrow \gamma X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.79 ± 0.20	273 ± 43	2 AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
seen	16	BALTRUSAIT..84	MRK3	$J/\psi \rightarrow 2\phi\gamma$

¹ MITCHELL 09 reports $(1.98 \pm 0.09 \pm 0.30) \times 10^{-2}$ from a measurement of $[\Gamma(J/\psi(1S) \rightarrow \gamma\eta_c(1S))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)]$ assuming $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (35.04 \pm 0.07 \pm 0.77) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (34.0 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Calculated by the authors using an average of $B(J/\psi \rightarrow \gamma\eta_c) \times B(\eta_c \rightarrow K\bar{K}\pi)$ from BALTRUSAITIS 86, BISELLO 91, BAI 04 and $B(\eta_c \rightarrow K\bar{K}\pi) = (8.5 \pm 1.8)\%$ from AUBERT 06E.

 Γ_{136}/Γ

NODE=M070R85

NODE=M070R85

NEW

 $\Gamma(\gamma\eta_c(1S) \rightarrow 3\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	EVTS
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3.8 ± 1.3	OUR AVERAGE
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Error includes scale factor of 1.1. $[(3.8^{+2.7}_{-1.0}) \times 10^{-6}$ OUR 2012 AVERAGE]

4.5 $\pm 1.2 \pm 0.6$	33 ± 9	ABLIKIM	13I	BES3	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$
1.2 $\pm 2.7 \pm 0.3$	1.2 ± 2.8	ADAMS	08	CLEO	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$

 Γ_{137}/Γ

NODE=M070S08

NODE=M070S08

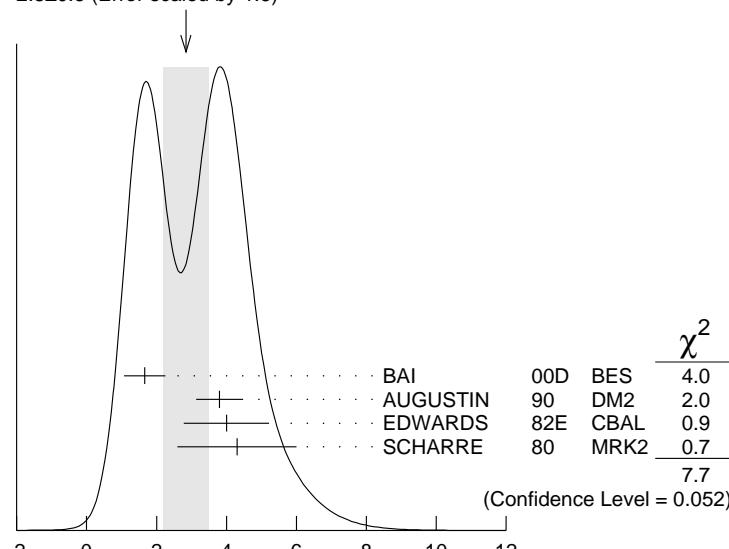
NEW

$\Gamma(\gamma\pi^+\pi^-2\pi^0)/\Gamma_{\text{total}}$ VALUE (units 10^{-3}) **$8.3 \pm 0.2 \pm 3.1$** ¹ 4π mass less than 2.0 GeV. Γ_{138}/Γ NODE=M070R99
NODE=M070R99 $\Gamma(\gamma\eta\pi\pi)/\Gamma_{\text{total}}$ VALUE (units 10^{-3}) **6.1 ± 1.0 OUR AVERAGE** $5.85 \pm 0.3 \pm 1.05$ $7.8 \pm 1.2 \pm 2.4$ Γ_{139}/Γ NODE=M070R96
NODE=M070R96¹ Broad enhancement at 1700 MeV. $\Gamma(\gamma\eta_2(1870) \rightarrow \gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-4}) **$6.2 \pm 2.2 \pm 0.9$** Γ_{140}/Γ NODE=M070S37
NODE=M070S37 $\Gamma(\gamma\eta(1405/1475) \rightarrow \gamma K\bar{K}\pi)/\Gamma_{\text{total}}$ Γ_{141}/Γ NODE=M070R89
NODE=M070R89VALUE (units 10^{-3}) **2.8 ± 0.6 OUR AVERAGE**

Error includes scale factor of 1.6. See the ideogram below.

 $1.66 \pm 0.1 \pm 0.58$ 1,2 BAI 00D BES $J/\psi \rightarrow \gamma K^{\pm} K_S^0 \pi^{\mp}$ $3.8 \pm 0.3 \pm 0.6$ 3 AUGUSTIN 90 DM2 $J/\psi \rightarrow \gamma K\bar{K}\pi$ $4.0 \pm 0.7 \pm 1.0$ 3 EDWARDS 82E CBAL $J/\psi \rightarrow K^+ K^- \pi^0 \gamma$ 4.3 ± 1.7 3,4 SCHARRE 80 MRK2 $e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

 $1.78 \pm 0.21 \pm 0.33$ 3,5,6 AUGUSTIN 92 DM2 $J/\psi \rightarrow \gamma K\bar{K}\pi$ $0.83 \pm 0.13 \pm 0.18$ 3,7,8 AUGUSTIN 92 DM2 $J/\psi \rightarrow \gamma K\bar{K}\pi$ $0.66^{+0.17}_{-0.16} + 0.24_{-0.15}$ 3,6,9 BAI 90C MRK3 $J/\psi \rightarrow \gamma K_S^0 K^{\pm} \pi^{\mp}$ $1.03^{+0.21}_{-0.18} + 0.26_{-0.19}$ 3,8,10 BAI 90C MRK3 $J/\psi \rightarrow \gamma K_S^0 K^{\pm} \pi^{\mp}$ 1 Interference with the $J/\psi(1S)$ radiative transition to the broad $K\bar{K}\pi$ pseudoscalar state around 1800 is $(0.15 \pm 0.01 \pm 0.05) \times 10^{-3}$.2 Interference with $J/\psi \rightarrow \gamma f_1(1420)$ is $(-0.03 \pm 0.01 \pm 0.01) \times 10^{-3}$.3 Includes unknown branching fraction $\eta(1405) \rightarrow K\bar{K}\pi$.4 Corrected for spin-zero hypothesis for $\eta(1405)$.5 From fit to the $a_0(980)\pi^- \pi^+$ partial wave.6 $a_0(980)\pi^-$ mode.7 From fit to the $K^*(892)K^- \pi^+$ partial wave.8 K^*K^- mode.9 From $a_0(980)\pi^-$ final state.10 From $K^*(890)K^-$ final state.WEIGHTED AVERAGE
 2.8 ± 0.6 (Error scaled by 1.6) $\Gamma(\gamma\eta(1405/1475) \rightarrow \gamma K\bar{K}\pi)/\Gamma_{\text{total}}$ (units 10^{-3})

$\Gamma(\gamma\eta(1405/1475) \rightarrow \gamma\gamma\rho^0)/\Gamma_{\text{total}}$				Γ_{142}/Γ	NODE=M070S30 NODE=M070S30
VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT		
0.78±0.20 OUR AVERAGE	Error includes scale factor of 1.8.				
1.07±0.17±0.11	1 BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$		
0.64±0.12±0.07	1 COFFMAN	90 MRK3	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$		
¹ Includes unknown branching fraction $\eta(1405) \rightarrow \gamma\rho^0$.					
$\Gamma(\gamma\eta(1405/1475) \rightarrow \gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$				Γ_{143}/Γ	
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.0 ±0.5 OUR AVERAGE					
2.6 ±0.7 ±0.4		BAI	99 BES	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	
3.38±0.33±0.64		1 BOLTON	92B MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
7.0 ±0.6 ±1.1	261	2 AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	
¹ Via $a_0(980)\pi$.					
² Includes unknown branching fraction to $\eta\pi^+\pi^-$.					
$\Gamma(\gamma\eta(1405/1475) \rightarrow \gamma\gamma\phi)/\Gamma_{\text{total}}$				Γ_{144}/Γ	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.82	95	BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma K^+K^-$	
$\Gamma(\gamma\rho\rho)/\Gamma_{\text{total}}$				Γ_{145}/Γ	
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT	
4.5 ±0.8 OUR AVERAGE					
4.7 ±0.3 ±0.9		1 BALTRUSAIT..86B	MRK3	$J/\psi \rightarrow 4\pi\gamma$	
3.75±1.05±1.20		2 BURKE	82 MRK2	$J/\psi \rightarrow 4\pi\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.09	90	3 BISELLO	89B	$J/\psi \rightarrow 4\pi\gamma$	
¹ 4π mass less than 2.0 GeV.					
² 4π mass less than 2.0 GeV. We have multiplied $2\rho^0$ measurement by 3 to obtain 2ρ .					
³ 4π mass in the range 2.0–25 GeV.					
$\Gamma(\gamma\rho\omega)/\Gamma_{\text{total}}$				Γ_{146}/Γ	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<5.4	90	ABLIKIM	08A BES2	$e^+e^- \rightarrow J/\psi$	
$\Gamma(\gamma\eta\phi)/\Gamma_{\text{total}}$				Γ_{147}/Γ	
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<8.8	90	ABLIKIM	08A BES2	$e^+e^- \rightarrow J/\psi$	
$\Gamma(\gamma\eta'(958))/\Gamma_{\text{total}}$				Γ_{148}/Γ	
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
5.16±0.14 OUR AVERAGE	Error includes scale factor of 1.1. [$(5.16 \pm 0.15) \times 10^{-3}$]				
OUR 2012 AVERAGE Scale factor = 1.1]					
4.82±0.23±0.08		1 ABLIKIM	11 BES3	$J/\psi \rightarrow \eta'\gamma$	
5.24±0.12±0.11		PEDLAR	09 CLE3	$J/\psi \rightarrow \eta'\gamma$	
5.55±0.44	35k	ABLIKIM	06E BES2	$J/\psi \rightarrow \eta'\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.50±0.14±0.53		BOLTON	92B MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta, \eta \rightarrow \gamma\gamma$	
4.30±0.31±0.71		BOLTON	92B MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta, \eta \rightarrow \pi^+\pi^-\pi^0$	OCCUR=2
4.04±0.16±0.85	622	AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	
4.39±0.09±0.66	2420	AUGUSTIN	90 DM2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$	
4.1 ±0.3 ±0.6		BLOOM	83 CBAL	$e^+e^- \rightarrow 3\gamma + \text{hadrons}$	
2.9 ±1.1	6	BRANDELIK	79C DASP	$e^+e^- \rightarrow 3\gamma$	
2.4 ±0.7	57	BARTEL	76 CNTR	$e^+e^- \rightarrow 2\gamma\rho$	
¹ ABLIKIM 11 reports $(4.84 \pm 0.03 \pm 0.24) \times 10^{-3}$ from a measurement of $[\Gamma(J/\psi(1S) \rightarrow \gamma\eta'(958))/\Gamma_{\text{total}}] / [\mathcal{B}(\eta'(958) \rightarrow \pi^+\pi^-\eta)] / [\mathcal{B}(\eta \rightarrow 2\gamma)]$ assuming $\mathcal{B}(\eta'(958) \rightarrow \pi^+\pi^-\eta) = (43.2 \pm 0.7) \times 10^{-2}$, $\mathcal{B}(\eta \rightarrow 2\gamma) = (39.31 \pm 0.20) \times 10^{-2}$, which we rescale to our best values $\mathcal{B}(\eta'(958) \rightarrow \pi^+\pi^-\eta) = (42.9 \pm 0.7) \times 10^{-2}$, $\mathcal{B}(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.					

$\Gamma(\gamma 2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

	DOCUMENT ID	TECN	COMMENT
2.8 ± 0.5 OUR AVERAGE Error includes scale factor of 1.9. See the ideogram below.			
4.32 ± 0.14 ± 0.73	1 BISELLO 89B	DM2	$J/\psi \rightarrow 4\pi\gamma$
2.08 ± 0.13 ± 0.35	2 BISELLO 89B	DM2	$J/\psi \rightarrow 4\pi\gamma$
3.05 ± 0.08 ± 0.45	2 BALTRUSAIT..86B	MRK3	$J/\psi \rightarrow 4\pi\gamma$
4.85 ± 0.45 ± 1.20	3 BURKE 82	MRK2	$e^+ e^-$

1 4π mass less than 3.0 GeV.2 4π mass less than 2.0 GeV.3 4π mass less than 2.5 GeV. Γ_{149}/Γ

NODE=M070R95

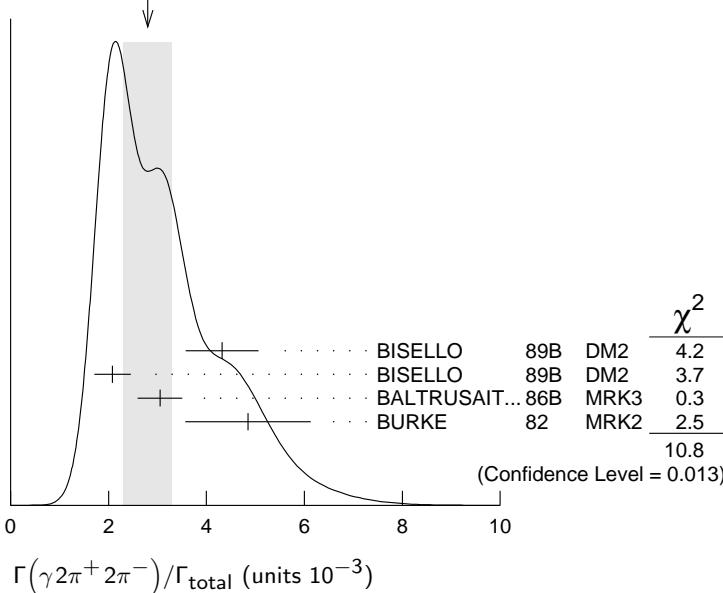
NODE=M070R95

OCCUR=2

NODE=M070R95;LINKAGE=A

NODE=M070R95;LINKAGE=B

NODE=M070R95;LINKAGE=M

WEIGHTED AVERAGE
2.8±0.5 (Error scaled by 1.9) $\Gamma(\gamma 2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$ (units 10^{-3}) $\Gamma(\gamma f_2(1270) f_2(1270))/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

	EVTS	DOCUMENT ID	TECN	COMMENT
9.5 ± 0.7 ± 1.6	646 ± 45	ABLIKIM	04M BES	$J/\psi \rightarrow \gamma 2\pi^+ 2\pi^-$

 Γ_{150}/Γ

NODE=M070S45

NODE=M070S45

 $\Gamma(\gamma f_2(1270) f_2(1270) (\text{non resonant}))/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

	DOCUMENT ID	TECN	COMMENT
8.2 ± 0.8 ± 1.7	1 ABLIKIM	04M BES	$J/\psi \rightarrow \gamma 2\pi^+ 2\pi^-$

 Γ_{151}/Γ

NODE=M070S46

NODE=M070S46

1 Subtracting contribution from intermediate $\eta_c(1S)$ decays. $\Gamma(\gamma K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

	EVTS	DOCUMENT ID	TECN	COMMENT
2.1 ± 0.1 ± 0.6	1516	BAI	00B BES	$J/\psi \rightarrow \gamma K^+ K^0 \pi^+ \pi^-$

 Γ_{152}/Γ

NODE=M070B05

NODE=M070B05

 $\Gamma(\gamma f_4(2050))/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

	DOCUMENT ID	TECN	COMMENT
2.7 ± 0.5 ± 0.5	1 BALTRUSAIT..87	MRK3	$J/\psi \rightarrow \gamma \pi^+ \pi^-$

 Γ_{153}/Γ

NODE=M070S7

NODE=M070S7

1 Assuming branching fraction $f_4(2050) \rightarrow \pi\pi/\text{total} = 0.167$. $\Gamma(\gamma \omega \omega)/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

	EVTS	DOCUMENT ID	TECN	COMMENT
1.61 ± 0.33 OUR AVERAGE				

 Γ_{154}/Γ

NODE=M070R97

NODE=M070R97

6.0 ± 4.8 ± 1.8

1.41 ± 0.2 ± 0.42 120 ± 17

1.76 ± 0.09 ± 0.45

ABLIKIM 08A BES2 $J/\psi \rightarrow \gamma \omega \pi^+ \pi^-$ BISELLO 87 SPEC $e^+ e^-, \text{hadrons} \gamma$ BALTRUSAIT..85C MRK3 $e^+ e^- \rightarrow \text{hadrons} \gamma$

$\Gamma(\gamma\eta(1405/1475) \rightarrow \gamma\rho^0\rho^0)/\Gamma_{\text{total}}$					Γ_{155}/Γ	
<u>VALUE (units 10^{-3})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1.7 ± 0.4 OUR AVERAGE				Error includes scale factor of 1.3.		
2.1 ± 0.4		BUGG 95	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-\pi^+\pi^-$		
1.36 ± 0.38		1,2 BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$		
1 Estimated by us from various fits.						NODE=M070S19;LINKAGE=A
2 Includes unknown branching fraction to $\rho^0\rho^0$.						NODE=M070S19;LINKAGE=B
$\Gamma(\gamma f_2(1270))/\Gamma_{\text{total}}$					Γ_{156}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1.43 ± 0.11 OUR AVERAGE						NODE=M070R86
1.62 $\pm 0.26^{+0.02}_{-0.05}$		1 ABLIKIM 06v	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$		NODE=M070R86
1.42 $\pm 0.21^{+0.02}_{-0.04}$		2 ABLIKIM 06v	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^0\pi^0$	OCCUR=2	
1.33 $\pm 0.05 \pm 0.20$		3 AUGUSTIN 87	DM2	$J/\psi \rightarrow \gamma\pi^+\pi^-$		
1.36 $\pm 0.09 \pm 0.23$		3 BALTRUSAIT..87	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-$		
1.48 $\pm 0.25 \pm 0.30$	178	EDWARDS 82B	CBAL	$e^+e^- \rightarrow 2\pi^0\gamma$		
2.0 ± 0.7	35	ALEXANDER 78	PLUT	e^+e^-		
1.2 ± 0.6	30	4 BRANDELIK 78B	DASP	$e^+e^- \rightarrow \pi^+\pi^-\gamma$		
1 ABLIKIM 06v reports $[\Gamma(J/\psi(1S) \rightarrow \gamma f_2(1270))/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] = (1.371 \pm 0.010 \pm 0.222) \times 10^{-3}$ which we divide by our best value $B(f_2(1270) \rightarrow \pi\pi) = (84.8^{+2.4}_{-1.2}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.						NODE=M070R86;LINKAGE=AI
2 ABLIKIM 06v reports $[\Gamma(J/\psi(1S) \rightarrow \gamma f_2(1270))/\Gamma_{\text{total}}] \times [B(f_2(1270) \rightarrow \pi\pi)] = (1.200 \pm 0.027 \pm 0.174) \times 10^{-3}$ which we divide by our best value $B(f_2(1270) \rightarrow \pi\pi) = (84.8^{+2.4}_{-1.2}) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.						NODE=M070R86;LINKAGE=AL
3 Estimated using $B(f_2(1270) \rightarrow \pi\pi) = 0.843 \pm 0.012$. The errors do not contain the uncertainty in the $f_2(1270)$ decay.						NODE=M070R86;LINKAGE=X
4 Restated by us to take account of spread of E1, M2, E3 transitions.						NODE=M070R86;LINKAGE=T
$\Gamma(\gamma f_0(1710) \rightarrow \gamma K\bar{K})/\Gamma_{\text{total}}$					Γ_{157}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
8.5 ± 1.2 OUR AVERAGE				Error includes scale factor of 1.2.		NODE=M070R91
9.62 $\pm 0.29^{+3.51}_{-1.86}$		1 BAI 03G	BES	$J/\psi \rightarrow \gamma K\bar{K}$		NODE=M070R91
5.0 $\pm 0.8^{+1.8}_{-0.4}$		2,3 BAI 96C	BES	$J/\psi \rightarrow \gamma K^+K^-$	OCCUR=2	
9.2 $\pm 1.4 \pm 1.4$		3 AUGUSTIN 88	DM2	$J/\psi \rightarrow \gamma K^+K^-$		
10.4 $\pm 1.2 \pm 1.6$		3 AUGUSTIN 88	DM2	$J/\psi \rightarrow \gamma K_S^0 K_S^0$		
9.6 $\pm 1.2 \pm 1.8$		3 BALTRUSAIT..87	MRK3	$J/\psi \rightarrow \gamma K^+K^-$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.6 $\pm 0.2^{+0.6}_{-0.2}$		3,4 BAI 96C	BES	$J/\psi \rightarrow \gamma K^+K^-$	OCCUR=2	
< 0.8	90	5 BISELLO 89B		$J/\psi \rightarrow 4\pi\gamma$	OCCUR=2	
1.6 $\pm 0.4 \pm 0.3$		6 BALTRUSAIT..87	MRK3	$J/\psi \rightarrow \gamma\pi^+\pi^-$		
3.8 ± 1.6		7 EDWARDS 82D	CBAL	$e^+e^- \rightarrow \eta\eta\gamma$		
1 Includes unknown branching ratio to K^+K^- or $K_S^0 K_S^0$.						NODE=M070R91;LINKAGE=K9
2 Assuming $J^P = 2^+$ for $f_0(1710)$.						NODE=M070R91;LINKAGE=A1
3 Includes unknown branching fraction to K^+K^- or $K_S^0 K_S^0$. We have multiplied K^+K^- measurement by 2, and $K_S^0 K_S^0$ by 4 to obtain $K\bar{K}$ result.						NODE=M070R91;LINKAGE=B
4 Assuming $J^P = 0^+$ for $f_0(1710)$.						
5 Includes unknown branching fraction to $\rho^0\rho^0$.						NODE=M070R91;LINKAGE=A2
6 Includes unknown branching fraction to $\pi^+\pi^-$.						NODE=M070R91;LINKAGE=C
7 Includes unknown branching fraction to $\eta\eta$.						NODE=M070R91;LINKAGE=Z
						NODE=M070R91;LINKAGE=A
$\Gamma(\gamma f_0(1710) \rightarrow \gamma\pi\pi)/\Gamma_{\text{total}}$					Γ_{158}/Γ	
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
4.0 ± 1.0 OUR AVERAGE						NODE=M070B01
3.96 $\pm 0.06 \pm 1.12$		1 ABLIKIM 06v	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^+\pi^-$		NODE=M070B01
3.99 $\pm 0.15 \pm 2.64$		1 ABLIKIM 06v	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma\pi^0\pi^0$	OCCUR=2	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
2.5 $\pm 1.6 \pm 0.8$		BAI 98H	BES	$J/\psi \rightarrow \gamma\pi^0\pi^0$		
1 Including unknown branching fraction to $\pi\pi$.						NODE=M070B01;LINKAGE=AB

$\Gamma(\gamma f_0(1710) \rightarrow \gamma\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{159}/Γ
$0.31 \pm 0.06 \pm 0.08$	180	ABLIKIM	06H BES	$J/\psi \rightarrow \gamma\omega\omega$	NODE=M070R01 NODE=M070R01

 $\Gamma(\gamma\eta)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{160}/Γ
1.104 ± 0.034 OUR AVERAGE					NODE=M070R83 NODE=M070R83

$1.101 \pm 0.029 \pm 0.022$		PEDLAR	09 CLE3	$J/\psi \rightarrow \eta\gamma$
1.123 ± 0.089	11k	ABLIKIM	06E BES2	$J/\psi \rightarrow \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.88 \pm 0.08 \pm 0.11$		BLOOM	83 CBAL	$e^+ e^-$
0.82 ± 0.10		BRANDELIK	79C DASP	$e^+ e^-$
1.3 ± 0.4	21	BARTEL	77 CNTR	$e^+ e^-$

 $\Gamma(\gamma f_1(1420) \rightarrow \gamma K\bar{K}\pi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{161}/Γ
0.79 ± 0.13 OUR AVERAGE					NODE=M070S31 NODE=M070S31

$0.68 \pm 0.04 \pm 0.24$		BAI	00D BES	$J/\psi \rightarrow \gamma K^\pm K_S^0 \pi^\mp$
$0.76 \pm 0.15 \pm 0.21$		1,2 AUGUSTIN	92 DM2	$J/\psi \rightarrow \gamma K\bar{K}\pi$
$0.87 \pm 0.14^{+0.14}_{-0.11}$		1 BAI	90C MRK3	$J/\psi \rightarrow \gamma K_S^0 K^\pm \pi^\mp$

¹ Included unknown branching fraction $f_1(1420) \rightarrow K\bar{K}\pi$.

² From fit to the $K^*(892)K$ 1^{++} partial wave.

 $\Gamma(\gamma f_1(1285))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{162}/Γ
0.61 ± 0.08 OUR AVERAGE					NODE=M070R88 NODE=M070R88

$0.69 \pm 0.16 \pm 0.20$		1 BAI	04J BES2	$J/\psi \rightarrow \gamma\gamma\rho^0$
$0.61 \pm 0.04 \pm 0.21$		2 BAI	00D BES	$J/\psi \rightarrow \gamma K^\pm K_S^0 \pi^\mp$
$0.45 \pm 0.09 \pm 0.17$		3 BAI	99 BES	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
$0.625 \pm 0.063 \pm 0.103$		4 BOLTON	92 MRK3	$J/\psi \rightarrow \gamma f_1(1285)$
$0.70 \pm 0.08 \pm 0.16$		5 BOLTON	92B MRK3	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$

¹ Assuming $B(f_1(1285) \rightarrow \rho^0\gamma) = 0.055 \pm 0.013$.

² Assuming $\Gamma(f_1(1285) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}} = 0.090 \pm 0.004$.

³ Assuming $\Gamma(f_1(1285) \rightarrow \eta\pi\pi)/\Gamma_{\text{total}} = 0.5 \pm 0.18$.

⁴ Obtained summing the sequential decay channels

$B(J/\psi \rightarrow \gamma f_1(1285), f_1(1285) \rightarrow \pi\pi\pi\pi) = (1.44 \pm 0.39 \pm 0.27) \times 10^{-4}$;
 $B(J/\psi \rightarrow \gamma f_1(1285), f_1(1285) \rightarrow a_0(980)\pi, a_0(980) \rightarrow \eta\pi) = (3.90 \pm 0.42 \pm 0.87) \times 10^{-4}$;

$B(J/\psi \rightarrow \gamma f_1(1285), f_1(1285) \rightarrow a_0(980)\pi, a_0(980) \rightarrow K\bar{K}) = (0.66 \pm 0.26 \pm 0.29) \times 10^{-4}$;

$B(J/\psi \rightarrow \gamma f_1(1285), f_1(1285) \rightarrow \gamma\rho^0) = (0.25 \pm 0.07 \pm 0.03) \times 10^{-4}$.

⁵ Using $B(f_1(1285) \rightarrow a_0(980)\pi) = 0.37$, and including unknown branching ratio for $a_0(980) \rightarrow \eta\pi$.

 $\Gamma(\gamma f_1(1510) \rightarrow \gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{163}/Γ
$4.5 \pm 1.0 \pm 0.7$		BAI	99 BES	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$	NODE=M070S36 NODE=M070S36

 $\Gamma(\gamma f'_2(1525))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{164}/Γ
4.5 ± 0.7 OUR AVERAGE						NODE=M070R87 NODE=M070R87

4.5 ± 0.7 OUR AVERAGE

$3.85 \pm 0.17^{+1.91}_{-0.73}$

$3.6 \pm 0.4^{+1.4}_{-0.4}$

$5.6 \pm 1.4 \pm 0.9$

$4.5 \pm 0.4 \pm 0.9$

$6.8 \pm 1.6 \pm 1.4$

1 BAI 03G BES $J/\psi \rightarrow \gamma K\bar{K}$

1 BAI 96C BES $J/\psi \rightarrow \gamma K^+ K^-$

1 AUGUSTIN 88 DM2 $J/\psi \rightarrow \gamma K^+ K^-$

1 AUGUSTIN 88 DM2 $J/\psi \rightarrow \gamma K_S^0 K_S^0$

1 BALTRUSAIT..87 MRK3 $J/\psi \rightarrow \gamma K^+ K^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<3.4	90	4	2 BRANDELIK	79C DASP	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
<2.3	90	3	ALEXANDER	78 PLUT	$e^+ e^- \rightarrow K^+ K^- \gamma$

¹ Using $B(f'_2(1525) \rightarrow K\bar{K}) = 0.888$.

² Assuming isotropic production and decay of the $f'_2(1525)$ and isospin.

NODE=M070R01
NODE=M070R01

NODE=M070R83
NODE=M070R83

NODE=M070S31
NODE=M070S31

OCCUR=2

NODE=M070S31;LINKAGE=A
NODE=M070S31;LINKAGE=D

NODE=M070R88
NODE=M070R88

NODE=M070R88;LINKAGE=BI
NODE=M070R88;LINKAGE=BD
NODE=M070R88;LINKAGE=BA
NODE=M070R88;LINKAGE=B

NODE=M070R88;LINKAGE=A

NODE=M070S36
NODE=M070S36

OCCUR=3

OCCUR=4

OCCUR=2

NODE=M070R87;LINKAGE=A1
NODE=M070R87;LINKAGE=I

$\Gamma(\gamma f_2(1640) \rightarrow \gamma\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{165}/Γ
$0.28 \pm 0.05 \pm 0.17$	141	ABLIKIM	06H BES	$J/\psi \rightarrow \gamma\omega\omega$	NODE=M070R02 NODE=M070R02

 $\Gamma(\gamma f_2(1910) \rightarrow \gamma\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{166}/Γ
$0.20 \pm 0.04 \pm 0.13$	151	ABLIKIM	06H BES	$J/\psi \rightarrow \gamma\omega\omega$	NODE=M070R03 NODE=M070R03

 $\Gamma(\gamma f_0(1800) \rightarrow \gamma\omega\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{167}/Γ
2.5 ± 0.6 OUR AVERAGE					NODE=M070S79 NODE=M070S79

 2.5 ± 0.6 OUR AVERAGE

$2.00 \pm 0.08^{+1.38}_{-1.64}$	1.3k	ABLIKIM	13J BES3	$J/\psi \rightarrow \gamma\omega\phi$
$2.61 \pm 0.27 \pm 0.65$	95	ABLIKIM	06J BES2	$J/\psi \rightarrow \gamma\omega\phi$

 $\Gamma(\gamma f_2(1950) \rightarrow \gamma K^*(892) \bar{K}^*(892))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{168}/Γ
$0.7 \pm 0.1 \pm 0.2$		BAI	00B BES	$J/\psi \rightarrow \gamma K^+ K^0 \pi^+ \pi^-$	NODE=M070B06 NODE=M070B06

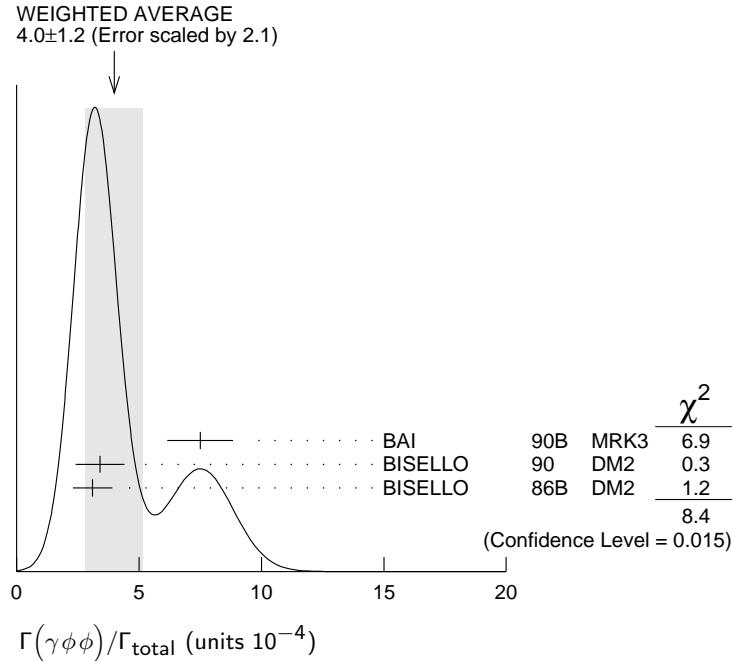
 $\Gamma(\gamma K^*(892) \bar{K}^*(892))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{169}/Γ
$4.0 \pm 0.3 \pm 1.3$	320	¹ BAI	00B BES	$J/\psi \rightarrow \gamma K^+ K^0 \pi^+ \pi^-$	NODE=M070B07 NODE=M070B07

¹ Summed over all charges. $\Gamma(\gamma\phi\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{170}/Γ
4.0 ± 1.2 OUR AVERAGE				Error includes scale factor of 2.1. See the ideogram below.	NODE=M070R98 NODE=M070R98

$7.5 \pm 0.6 \pm 1.2$	168	BAI	90B MRK3	$J/\psi \rightarrow \gamma 4K$
$3.4 \pm 0.8 \pm 0.6$	33 ± 7	¹ BISELLO	90 DM2	$J/\psi \rightarrow \gamma K^+ K^- K^0_S K^0_L$
$3.1 \pm 0.7 \pm 0.4$		¹ BISELLO	86B DM2	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$

¹ $\phi\phi$ mass less than 2.9 GeV, η_C excluded. $\Gamma(\gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{171}/Γ
$0.38 \pm 0.07 \pm 0.07$		49	EATON	84	MRK2 $e^+ e^-$	NODE=M070R90 NODE=M070R90

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.11	90	PERUZZI	78	MRK1 $e^+ e^-$
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$\Gamma(\gamma\eta(2225))/\Gamma_{\text{total}}$					Γ_{172}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.33±0.05 OUR AVERAGE						
0.44±0.04±0.08	196 ± 19	1 ABLIKIM	08I BES	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$		NODE=M070S21
0.33±0.08±0.05		1 BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$		NODE=M070S21
0.27±0.06±0.06		1 BAI	90B MRK3	$J/\psi \rightarrow \gamma K^+ K^- K_S^0 K_L^0$	OCCUR=2	
0.24 ^{+0.15} _{-0.10}		2,3 BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$		
1 Includes unknown branching fraction to $\phi\phi$.						
2 Estimated by us from various fits.						
3 Includes unknown branching fraction to $\rho^0\rho^0$.						
$\Gamma(\gamma\eta(1760) \rightarrow \gamma\rho^0\rho^0)/\Gamma_{\text{total}}$					Γ_{173}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.13±0.09		1,2 BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$		NODE=M070S20
1 Estimated by us from various fits.						
2 Includes unknown branching fraction to $\rho^0\rho^0$.						
$\Gamma(\gamma\eta(1760) \rightarrow \gamma\omega\omega)/\Gamma_{\text{total}}$					Γ_{174}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1.98±0.08±0.32	1045	ABLIKIM	06H BES	$J/\psi \rightarrow \gamma\omega\omega$		NODE=M070R04
NODE=M070R04						
$\Gamma(\gamma X(1835) \rightarrow \gamma\pi^+\pi^-\eta')/\Gamma_{\text{total}}$					Γ_{175}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
2.6 ± 0.4 OUR AVERAGE						NODE=M070R78
2.87±0.09 ^{+0.49} _{-0.52}	4265	1 ABLIKIM	11C BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$		NODE=M070R78
2.2 ± 0.4 ± 0.4	264	ABLIKIM	05R BES2	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$		
1 From a fit of the $\pi^+\pi^-\eta'$ mass distribution to a combination of $\gamma f_1(1510)$, $\gamma X(1835)$, and two unconfirmed states $\gamma X(2120)$, and $\gamma X(2370)$, for $M(p\bar{p}) < 2.8$ GeV, and accounting for backgrounds from non- η' events and $J/\psi \rightarrow \pi^0\pi^+\pi^-\eta'$.						
$\Gamma(\gamma X(1835) \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$					Γ_{176}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.77^{+0.15}_{-0.09} OUR AVERAGE						NODE=M070S71
[(0.75 ^{+0.19} _{-0.09}) × 10 ⁻⁴ OUR 2012 AVERAGE]						
0.90 ^{+0.04} _{-0.11} ^{+0.27} _{-0.55}		1 ABLIKIM	12D BES3	$J/\psi \rightarrow \gamma p\bar{p}$		NEW
1.14 ^{+0.43} _{-0.30} ^{+0.42} _{-0.26}	231	2 ALEXANDER	10 CLEO	$J/\psi \rightarrow \gamma p\bar{p}$		
0.70±0.04 ^{+0.19} _{-0.08}		BAI	03F BES2	$J/\psi \rightarrow \gamma p\bar{p}$		
1 From the fit including final state interaction effects in isospin 0 S-wave according to SIBIRTSEV 05A.						
2 From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma X(1835)$, γR with $M(R) = 2100$ MeV and $\Gamma(R) = 160$ MeV, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV.						
$\Gamma(\gamma(K\bar{K}\pi)[JPC=0-+])/\Gamma_{\text{total}}$					Γ_{177}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.7 ± 0.4 OUR AVERAGE				Error includes scale factor of 2.1.		
0.58±0.03±0.20		1 BAI	00D BES	$J/\psi \rightarrow \gamma K^\pm K_S^0 \pi^\mp$		NODE=M070S38
2.1 ± 0.1 ± 0.7		2 BAI	00D BES	$J/\psi \rightarrow \gamma K^\pm K_S^0 \pi^\mp$	OCCUR=2	NODE=M070S38
1 For a broad structure around 1800 MeV.						
2 For a broad structure around 2040 MeV.						
$\Gamma(\gamma\pi^0)/\Gamma_{\text{total}}$					Γ_{178}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
3.49^{+0.33}_{-0.30} OUR AVERAGE						NODE=M070R82
3.63±0.36±0.13		PEDLAR	09 CLE3	$J/\psi \rightarrow \pi^0\gamma$		NODE=M070R82
3.13 ^{+0.65} _{-0.47}	586	ABLIKIM	06E BES2	$J/\psi \rightarrow \pi^0\gamma$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
3.6 ± 1.1 ± 0.7		BLOOM	83 CBAL	e^+e^-		
7.3 ± 4.7	10	BRANDELIK	79C DASP	e^+e^-		

$\Gamma(\gamma p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{179}/Γ
<0.79	90	EATON	84	MRK2 e^+e^-	

 $\Gamma(\gamma\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{180}/Γ
<0.13	90	HENRARD	87	DM2 e^+e^-	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.16	90	BAI	98G	BES e^+e^-
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 $\Gamma(\gamma f_0(2200))/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{181}/Γ
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1.5	1 AUGUSTIN	88	DM2	$J/\psi \rightarrow \gamma K_S^0 K_S^0$
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1 Includes unknown branching fraction to $K_S^0 K_S^0$.

 $\Gamma(\gamma f_J(2220))/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{182}/Γ
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>250	99.9	1 HASAN	96	SPEC	$\bar{p}p \rightarrow \pi^+ \pi^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

>300	2 BAI	96B	BES	$e^+e^- \rightarrow \gamma \bar{p}p, K\bar{K}$
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< 2.3	3 AUGUSTIN	88	DM2	$J/\psi \rightarrow \gamma K^+ K^-$
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< 1.6	3 AUGUSTIN	88	DM2	$J/\psi \rightarrow \gamma K_S^0 K_S^0$
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$12.4^{+6.4}_{-5.2} \pm 2.8$	23	3 BALTRUSAIT..86D	MRK3	$J/\psi \rightarrow \gamma K_S^0 K_S^0$
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$8.4^{+3.4}_{-2.8} \pm 1.6$	93	3 BALTRUSAIT..86D	MRK3	$J/\psi \rightarrow \gamma K^+ K^-$
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1 Using BAI 96B.

2 Using BARNEs 93.

3 Includes unknown branching fraction to $K^+ K^-$ or $K_S^0 K_S^0$.

 $\Gamma(\gamma f_J(2220) \rightarrow \gamma \pi\pi)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{183}/Γ
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$0.84 \pm 0.26 \pm 0.30$	BAI	96B	BES	$e^+e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1.4 $\pm 0.8 \pm 0.4$	BAI	98H	BES	$J/\psi \rightarrow \gamma \pi^0 \pi^0$
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 $\Gamma(\gamma f_J(2220) \rightarrow \gamma K\bar{K})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{184}/Γ
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< 3.6	1 DEL-AMO-SA..100	BABR	$e^+e^- \rightarrow J/\psi \rightarrow \gamma K^+ K^-$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

< 2.9	1 DEL-AMO-SA..100	BABR	$e^+e^- \rightarrow J/\psi \rightarrow \gamma K_S^0 K_S^0$
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$6.6 \pm 2.9 \pm 2.4$	BAI	96B	BES	$e^+e^- \rightarrow J/\psi \rightarrow \gamma K^+ K^-$
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$10.8 \pm 4.0 \pm 3.2$	BAI	96B	BES	$e^+e^- \rightarrow J/\psi \rightarrow \gamma K_S^0 K_S^0$
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1 For spin 2 and helicity 0; other combinations lead to more stringent upper limits.

 $\Gamma(\gamma f_J(2220) \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{185}/Γ
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$1.5 \pm 0.6 \pm 0.5$	BAI	96B	BES	$e^+e^- \rightarrow J/\psi \rightarrow \gamma p\bar{p}$
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 $\Gamma(\gamma f_0(1500))/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{186}/Γ
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1.01 ± 0.32 OUR AVERAGE

1.00 $\pm 0.03 \pm 0.45$	1 ABLIKIM	06v	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma \pi^+ \pi^-$
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1.02 $\pm 0.09 \pm 0.45$	1 ABLIKIM	06v	BES2	$e^+e^- \rightarrow J/\psi \rightarrow \gamma \pi^0 \pi^0$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

>5.7 ± 0.8	2,3 BUGG	95	MRK3	$J/\psi \rightarrow \gamma \pi^+ \pi^- \pi^+ \pi^-$
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1 Including unknown branching fraction to $\pi\pi$.

2 Including unknown branching ratio for $f_0(1500) \rightarrow \pi^+ \pi^- \pi^+ \pi^-$.

3 Assuming that $f_0(1500)$ decays only to two S-wave dipions.

NODE=M070R93

NODE=M070R93

NODE=M070S18

NODE=M070S18

NODE=M070R92

NODE=M070R92

NODE=M070B03

NODE=M070B03

NODE=M070S32

NODE=M070S32

NODE=M070S32;LINKAGE=AB

NODE=M070S32;LINKAGE=A

NODE=M070S32;LINKAGE=B

$\Gamma(\gamma A \rightarrow \gamma \text{ invisible})/\Gamma_{\text{total}}$
(narrow state A with $m_A < 960$ MeV)

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<6.3	90	1 INSLER	10 CLEO	$e^+ e^- \rightarrow \pi^+ \pi^- J/\psi$

¹ The limit varies with mass m_A of a narrow state A and is 4.3×10^{-6} for $m_A = 0$ MeV, reaches its largest value of 6.3×10^{-6} at $m_A = 500$ MeV, and is 3.6×10^{-6} at $m_A = 960$ MeV.

 Γ_{187}/Γ

NODE=M070S68
NODE=M070S68

NODE=M070S68;LINKAGE=IN

$\Gamma(\gamma A^0 \rightarrow \gamma \mu^+ \mu^-)/\Gamma_{\text{total}}$
(narrow state A^0 with 0.2 GeV $< m_{A^0} < 3$ GeV)

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<2.1	90	1 ABLIKIM	12 BES3	$J/\psi \rightarrow \gamma \mu^+ \mu^-$

¹ For a narrow scalar or pseudoscalar, A^0 , with a mass in the range 0.21–3.00 GeV. The measured 90% CL limit as a function of m_{A^0} ranges from 4×10^{-7} to 2.1×10^{-5} .

 Γ_{188}/Γ

NODE=M070S76
NODE=M070S76

NODE=M070S76;LINKAGE=AB

WEAK DECAYS $\Gamma(D^- e^+ \nu_e + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<1.2	90	ABLIKIM	06M BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{189}/Γ

NODE=M070S53
NODE=M070S53

NODE=M070S54
NODE=M070S54

 $\Gamma(\bar{D}^0 e^+ e^- + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<1.1	90	ABLIKIM	06M BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{190}/Γ

NODE=M070S54
NODE=M070S54

 $\Gamma(D_s^- e^+ \nu_e + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<3.6	90	1 ABLIKIM	06M BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{191}/Γ

NODE=M070S55
NODE=M070S55

NODE=M070S55;LINKAGE=AB

 $\Gamma(D^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<7.5 \times 10^{-5}$	90	ABLIKIM	08J BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{192}/Γ

NODE=M070S61
NODE=M070S61

 $\Gamma(\bar{D}^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.7 \times 10^{-4}$	90	ABLIKIM	08J BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{193}/Γ

NODE=M070S62
NODE=M070S62

 $\Gamma(D_s^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.3 \times 10^{-4}$	90	ABLIKIM	08J BES2	$e^+ e^- \rightarrow J/\psi$

 Γ_{194}/Γ

NODE=M070S63
NODE=M070S63

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 0.5	90	ADAMS	08 CLEO	$\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$

 Γ_{195}/Γ

NODE=M070R80
NODE=M070R80

• • • We do not use the following data for averages, fits, limits, etc. • • •

<16	90	1 WICHT	08 BELL	$B^\pm \rightarrow K^\pm \gamma\gamma$
< 2.2	90	ABLIKIM	07J BES2	$\psi(2S) \rightarrow J/\psi \pi^+ \pi^-$
<50	90	BARTEL	77 CNTR	$e^+ e^- \rightarrow J/\psi$

¹ WICHT 08 reports $[\Gamma(J/\psi(1S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow J/\psi(1S) K^+)] < 0.16 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow J/\psi(1S) K^+) = 1.028 \times 10^{-3}$.

NODE=M070R80;LINKAGE=WI

LEPTON FAMILY NUMBER (*LF*) VIOLATING MODES $\Gamma(e^\pm \mu^\mp)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.1	90	BAI	03D BES	$e^+ e^- \rightarrow J/\psi$

 Γ_{196}/Γ

NODE=M070S39
NODE=M070S39

NODE=M070315

 $\Gamma(e^\pm \tau^\mp)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<8.3	90	ABLIKIM	04 BES	$e^+ e^- \rightarrow J/\psi$

 Γ_{197}/Γ

NODE=M070S40
NODE=M070S40

$\Gamma(\mu^\pm \tau^\mp)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{198}/Γ
<2.0	90	ABLIKIM	04	BES $e^+ e^- \rightarrow J/\psi$	

OTHER DECAYS $\Gamma(\text{invisible})/\Gamma(\mu^+ \mu^-)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{199}/Γ_7
$<1.2 \times 10^{-2}$	90	ABLIKIM	08G	BES2 $\psi(2S) \rightarrow \pi^+ \pi^- J/\psi$	

J/ ψ (1S) REFERENCES

ABLIKIM	13F	arXiv:1211.4682 (PR D)	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54920
ABLIKIM	13I	PR D87 032003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54954
ABLIKIM	13J	PR D87 032008	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54955
ABLIKIM	12	PR D85 092012	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54265
ABLIKIM	12B	PR D86 032008	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54267
ABLIKIM	12C	PR D86 032014	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54268
ABLIKIM	12D	PR D86 112003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54269
ABLIKIM	12H	PL B710 594	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54273
ABLIKIM	12P	CP C36 1031	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=54863
LEES	12E	PR D85 112009	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54297
METREVELI	12	PR D85 092007	Z. Metreveli <i>et al.</i>	(NWES, FLOR, WAYN+)	REFID=54304
ABLIKIM	11	PR D83 012003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53646
ABLIKIM	11C	PR D106 072002	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53684
ABLIKIM	11D	PR D83 032003	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=16715
ABLIKIM	10C	PL B685 27	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53349
ABLIKIM	10E	PL B693 88	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53361
ALEXANDER	10	PR D82 092002	J.P. Alexander <i>et al.</i>	(CLEO Collab.)	REFID=53252
ANASHIN	10	PL B685 134	V.V. Anashin <i>et al.</i>	(KEDR Collab.)	REFID=53220
DEL-AMO-SA...	100	PR D105 172001	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=53533
INSLER	10	PR D81 091101	J. Insler <i>et al.</i>	(CLEO Collab.)	REFID=53359
ABLIKIM	09	PL B676 25	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52718
ABLIKIM	09B	PR D80 052004	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53099
MITCHELL	09	PRL 102 011801	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)	REFID=52676
PEDLAR	09	PR D79 111101	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)	REFID=52998
SHEN	09	PR D80 031101	C.P. Shen <i>et al.</i>	(BELLE Collab.)	REFID=53000
ABLIKIM	08	EPJ C53 15	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52047
ABLIKIM	08A	PR D77 012001	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52128
ABLIKIM	08C	PL B659 789	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52130
ABLIKIM	08E	PR D77 032005	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52143
ABLIKIM	08F	PRL 100 102003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52154
ABLIKIM	08G	PR D100 192001	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52253
ABLIKIM	08I	PL B662 330	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52255
ABLIKIM	08J	PL B663 297	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52256
ABLIKIM	08O	PR D78 092005	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52571
ADAMS	08	PR D101 101801	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=52261
AUBERT	08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52242
BESSON	08	PR D78 032012	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=52685
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)	REFID=52166
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)	REFID=52204
ABLIKIM	07H	PR D76 092003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52046
ABLIKIM	07J	PR D76 117101	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52072
ANDREOTTI	07	PL B654 74	M. Andreotti <i>et al.</i>	(Femilab E935 Collab.)	REFID=51944
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51908
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52049
Also		PR D77 119902E (errat.)	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52266
AUBERT	07BD	PR D76 092006	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52050
ABLIKIM	06	PL B632 181	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50986
ABLIKIM	06C	PL B633 681	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51037
ABLIKIM	06E	PR D73 052008	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51057
ABLIKIM	06F	PR D73 052007	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51058
ABLIKIM	06H	PR D73 112007	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51125
ABLIKIM	06J	PR D76 112002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51127
ABLIKIM	06K	PR D76 092001	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=51128
ABLIKIM	06M	PL B639 418	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51130
ABLIKIM	06V	PL B642 441	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51507
ADAMS	06A	PR D73 051103	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=51036
AUBERT	06B	PR D73 012005	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51026
AUBERT	06D	PR D73 052003	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51047
AUBERT	06E	PRL 96 052002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51059
AUBERT,BE	06D	PR D74 091103	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51511
WU	06	PR D77 162003	C.-H. Wu <i>et al.</i>	(BELLE Collab.)	REFID=51472
ABLIKIM	05	PL B607 243	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50450
ABLIKIM	05B	PR D71 032003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50496
ABLIKIM	05C	PL B610 192	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50507
ABLIKIM	05H	PR D72 012002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50759
ABLIKIM	05R	PR D76 262001	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50985
AUBERT	05D	PR D71 052001	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50509
LI	05C	PR D71 111103	Z. Li <i>et al.</i>	(CLEO Collab.)	REFID=50802
SIBIRTSEV	05A	PR D71 054010	A. Sibirtsev, J. Haidenbauer	(BES Collab.)	REFID=51038
ABLIKIM	04	PL B598 172	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=49739
ABLIKIM	04M	PR D70 112008	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50329
AUBERT	04	PR D69 011103	B. Aubert <i>et al.</i>	(BaBar Collab.)	REFID=49611
AUBERT,B	04N	PR D70 072004	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50184
BAI	04	PL B578 16	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49620
BAI	04A	PR D69 012003	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49607
BAI	04D	PL B589 7	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49750
BAI	04E	PL B591 42	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49751
BAI	04G	PR D70 012004	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49753
BAI	04H	PR D70 012005	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49754
BAI	04J	PL B594 47	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50167
SETH	04	PR D69 097503	K.K. Seth	(KEDR Collab.)	REFID=49779
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(BES Collab.)	REFID=49579
BAI	03D	PL B561 49	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49403
BAI	03F	PR D91 022001	J.Z. Bai <i>et al.</i>	(BES II Collab.)	REFID=49473

NODE=M070S41
NODE=M070S41

NODE=M070325

NODE=M070S60
NODE=M070S60

NODE=M070

BAI	03G	PR D68 052003	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49580
HUANG	03	PRL 91 241802	H.-C. Huang <i>et al.</i>	(BELLE Collab.)	REFID=49621
BAI	02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50506
ARTAMONOV	00	PL B474 427	A.S. Artamonov <i>et al.</i>		REFID=47424
BAI	00	PRL 84 594	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50503
BAI	00B	PL B472 200	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47427
BAI	00D	PL B476 25	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47954
BAI	99	PL B446 356	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46606
BAI	99C	PRL 83 1918	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47420
BAI	98D	PR D58 092006	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46338
BAI	98G	PL B424 213	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46341
BAI	98H	PRL 81 1179	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46342
BALDINI	98	PL B444 111	R. Baldini <i>et al.</i>	(FENICE Collab.)	REFID=46608
ARMSTRONG	96	PR D54 7067	T.A. Armstrong <i>et al.</i>	(E760 Collab.)	REFID=45146
BAI	96B	PRL 76 3502	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=44736
BAI	96C	PRL 77 3959	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=45169
BAI	96D	PR D54 1221	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=45198
GRIBUSHIN	96	PR D53 4723	A. Gribushin <i>et al.</i>	(E672 Collab., E706 Collab.)	REFID=44739
HASAN	96	PL B388 376	A. Hasan, D.V. Bugg	(BRUN, LOQM)	REFID=45197
BAI	95B	PL B355 374	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=44434
BUGG	95	PL B353 378	D.V. Bugg <i>et al.</i>	(LOQM, PNPI, WASH)	REFID=44438
ANTONELLI	93	PL B301 317	A. Antonelli <i>et al.</i>	(FENICE Collab.)	REFID=43314
ARMSTRONG	93B	PR D47 772	T.A. Armstrong <i>et al.</i>	(FNAL E760 Collab.)	REFID=43307
BARNES	93	PL B309 469	P.D. Barnes <i>et al.</i>	(PS185 Collab.)	REFID=43601
AUGUSTIN	92	PR D46 1951	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41584
BOLTON	92	PL B278 495	T. Bolton <i>et al.</i>	(Mark III Collab.)	REFID=42175
BOLTON	92B	PRL 69 1328	T. Bolton <i>et al.</i>	(Mark III Collab.)	REFID=42176
COFFMAN	92	PRL 68 282	D.M. Coffman <i>et al.</i>	(Mark III Collab.)	REFID=41866
HSUEH	92	PR D45 R2181	S. Hsueh, S. Palestini	(FNAL, TORI)	REFID=41899
BISELLO	91	NP B350 1	D. Bisello <i>et al.</i>	(DM2 Collab.)	REFID=41668
AUGUSTIN	90	PR D42 10	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=41352
BAI	90B	PRL 65 1309	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41354
BAI	90C	PRL 65 2507	Z. Bai <i>et al.</i>	(Mark III Collab.)	REFID=41578
BISELLO	90	PL B241 617	D. Bisello <i>et al.</i>	(DM2 Collab.)	REFID=41359
COFFMAN	90	PR D41 1410	D.M. Coffman <i>et al.</i>	(Mark III Collab.)	REFID=41350
JOUSSET	90	PR D41 1389	J. Jousset <i>et al.</i>	(DM2 Collab.)	REFID=41349
ALEXANDER	89	NP B320 45	J.P. Alexander <i>et al.</i>	(LBL, MICH, SLAC)	REFID=40345
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)	REFID=41004
BISELLO	89B	PR D39 701	G. Busetto <i>et al.</i>	(DM2 Collab.)	REFID=40575
AUGUSTIN	88	PRL 60 2238	J.E. Augustin <i>et al.</i>	(DM2 Collab.)	REFID=40574
COFFMAN	88	PR D38 2695	D.M. Coffman <i>et al.</i>	(Mark III Collab.)	REFID=40346
FALVARD	88	PR D38 2706	A. Falvard <i>et al.</i>	(CLER, FRAS, LALO+)	REFID=40576
AUGUSTIN	87	ZPHY C36 369	J.E. Augustin <i>et al.</i>	(LAPO, CERN, GENO, LYON+)	REFID=40268
BAGLIN	87	NP B286 592	C. Baglin <i>et al.</i>	(R.M. Baltrusaitis <i>et al.</i>)	REFID=40002
BALTRUSAIT... 87		PR D35 2077	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=40010
BECKER	87	PRL 59 186	J.J. Becker <i>et al.</i>	(Mark III Collab.)	REFID=40015
BISELLO	87	PL B192 239	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)	REFID=40012
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)	REFID=11616
HENRARD	87	NP B292 670	P. Henrard <i>et al.</i>	(CLER, FRAS, LALO+)	REFID=40261
PALLIN	87	NP B292 653	D. Pallin <i>et al.</i>	(CLER, FRAS, LALO, PADO)	REFID=40243
BALTRUSAIT... 86		PR D33 629	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=22009
BALTRUSAIT... 86B		PR D33 1222	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)	REFID=22100
BALTRUSAIT... 86D		PRL 56 107	R.M. Baltrusaitis	(CIT, UCSC, ILL, SLAC+)	REFID=21865
BISELLO	86B	PL B179 294	D. Bisello <i>et al.</i>	(DM2 Collab.)	REFID=22101
GAISER	86	PR D34 711	J. Gaisser <i>et al.</i>	(Crystal Ball Collab.)	REFID=22012
BALTRUSAIT... 85C		PRL 55 1723	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+)	REFID=22095
BALTRUSAIT... 85D		PR D32 566	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+) (NOVO)	REFID=22097
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)	REFID=40033
Translated from YAF 41 733.					
BALTRUSAIT... 84		PRL 52 2126	R.M. Baltrusaitis <i>et al.</i>	(CIT, UCSC+)	REFID=22006
EATON	84	PR D29 804	M.W. Eaton <i>et al.</i>	(LBL, SLAC)	REFID=22092
BLOOM	83	ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)	REFID=21682
EDWARDS	83B	PRL 51 859	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21318
FRANKLIN	83	PRL 51 963	M.E.B. Franklin <i>et al.</i>	(LBL, SLAC)	REFID=22216
BURKE	82	PRL 49 632	D.L. Burke <i>et al.</i>	(LBL, SLAC)	REFID=21676
EDWARDS	82B	PR D25 3065	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=22080
EDWARDS	82D	PRL 48 458	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21677
Also		ARNS 33 143	E.D. Bloom, C. Peck	(SLAC, CIT)	REFID=21682
EDWARDS	82E	PR 49 259	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=21314
LEMOIGNE	82	PL 113B 509	Y. Lemoigne <i>et al.</i>	(SACL, LOIC, SHMP+)	REFID=22084
BESCH	81	ZPHY C8 1	H.J. Besch <i>et al.</i>	(BONN, DESY, MANZ)	REFID=22077
GIDAL	81	PL 107B 153	G. Gidal <i>et al.</i>	(SLAC, LBL)	REFID=20386
PARTRIDGE	80	PRL 44 712	R. Partridge <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=22073
SCHARRE	80	PL 97B 329	D.L. Scharre <i>et al.</i>	(SLAC, LBL)	REFID=21329
ZHOLENTZ	80	PL 96B 214	A.A. Zholents <i>et al.</i>	(NOVO)	REFID=10320
Also		SJNP 34 814	A.A. Zholents <i>et al.</i>	(NOVO)	REFID=10321
Translated from YAF 34 1471.					
BRANDELIK	79C	ZPHY C1 233	R. Brandelik <i>et al.</i>	(DASP Collab.)	REFID=22114
ALEXANDER	78	PL 72B 493	G. Alexander <i>et al.</i>	(DESY, HAMB, SIEG+)	REFID=22065
BESCH	78	PL 78B 347	H.J. Besch <i>et al.</i>	(BONN, DESY, MANZ)	REFID=22066
BRANDELIK	78B	PL 74B 292	R. Brandelik <i>et al.</i>	(DASP Collab.)	REFID=22067
PERUZZI	78	PR D17 2901	I. Peruzzi <i>et al.</i>	(SLAC, LBL)	REFID=22068
BARTEL	77	PL 66B 489	W. Bartel <i>et al.</i>	(DESY, HEIDP)	REFID=22058
BURMESTER	77D	PL 72B 135	J. Burmester <i>et al.</i>	(DESY, HAMB, SIEG+)	REFID=22060
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)	REFID=22062
VANNUCCI	77	PR D15 1814	F. Vannucci <i>et al.</i>	(SLAC, LBL)	REFID=22063
BARTEL	76	PL 64B 483	W. Bartel <i>et al.</i>	(DESY, HEIDP)	REFID=22192
BRAUNSCH...	76	PL 63B 487	W. Braunschweig <i>et al.</i>	(DASP Collab.)	REFID=22054
JEAN-MARIE	76	PRL 36 291	B. Jean-Marie <i>et al.</i>	(SLAC, LBL) IG	REFID=22056
BALDINI...	75	PL 58B 471	R. Baldini-Celio <i>et al.</i>	(FRAS, ROMA)	REFID=22026
BOYARSKI	75	PRL 34 1357	A.M. Boyarski <i>et al.</i>	(SLAC, LBL) JPC	REFID=22030
DASP	75	PL 56B 491	W. Braunschweig <i>et al.</i>	(DASP Collab.)	REFID=22036
ESPOSITO	75B	LNC 14 73	B. Esposito <i>et al.</i>	(FRAS, NAPL, PADO+)	REFID=22038
FORD	75	PRL 34 604	R.L. Ford <i>et al.</i>	(SLAC, PENN)	REFID=22039

NODE=M056

 $\chi_{c0}(1P)$ $I^G(J^{PC}) = 0^+(0^{++})$ **$\chi_{c0}(1P)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3414.75 ± 0.31 OUR AVERAGE				
3414.2 ± 0.5 ± 2.3	5.4k	UEHARA 08	BELL	$\gamma\gamma \rightarrow \chi_{c0} \rightarrow$ hadrons
3406 ± 7 ± 6	230	¹ ABE 07	BELL	$e^+ e^- \rightarrow J/\psi(c\bar{c})$
3414.21 ± 0.39 ± 0.27		ABLIKIM 05G	BES2	$\psi(2S) \rightarrow \gamma\chi_{c0}$
3414.7 ± 0.7 ± 0.2		² ANDREOTTI 03	E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow \pi^0\pi^0$
3415.5 ± 0.4 ± 0.4	392	³ BAGNASCO 02	E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow J/\psi\gamma$
3417.4 ± 1.8 ± 0.2		² AMBROGIANI 99B	E835	$\bar{p}p \rightarrow e^+ e^- \gamma$
3414.1 ± 0.6 ± 0.8		BAI 99B	BES	$\psi(2S) \rightarrow \gamma X$
3417.8 ± 0.4 ± 4		² GAISER 86	CBAL	$\psi(2S) \rightarrow \gamma X$
3416 ± 3 ± 4		⁴ TANENBAUM 78	MRK1	$e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3416.5 ± 3.0		EISENSTEIN 01	CLE2	$e^+ e^- \rightarrow e^+ e^- \chi_{c0}$
3422 ± 10		⁴ BARTEL 78B	CNTR	$e^+ e^- \rightarrow J/\psi 2\gamma$
3415 ± 9		⁴ BIDDICK 77	CNTR	$e^+ e^- \rightarrow \gamma X$

1 From a fit of the J/ψ recoil mass spectrum. Supersedes ABE, K 02 and ABE 04G.2 Using mass of $\psi(2S) = 3686.0$ MeV.3 Recalculated by ANDREOTTI 05A, using the value of $\psi(2S)$ mass from AULCHENKO 03.4 Mass value shifted by us by amount appropriate for $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.

NODE=M056M

NODE=M056M

NODE=M056M;LINKAGE=EB

NODE=M056M;LINKAGE=C

NODE=M056M;LINKAGE=NW

NODE=M056M;LINKAGE=D

 $\chi_{c0}(1P)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
10.3 ± 0.6 OUR FIT				
[10.4 ± 0.6 MeV OUR 2012 FIT]				
10.5 ± 0.8 OUR AVERAGE Error includes scale factor of 1.1.				
10.6 ± 1.9 ± 2.6	5.4k	UEHARA 08	BELL	$\gamma\gamma \rightarrow \chi_{c0} \rightarrow$ hadrons
12.6 ^{+1.5} _{-1.6} ^{+0.9} _{-1.1}		ABLIKIM 05G	BES2	$\psi(2S) \rightarrow \gamma\chi_{c0}$
8.6 ^{+1.7} _{-1.3} ^{+0.1}		ANDREOTTI 03	E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow \pi^0\pi^0$
9.7 ± 1.0	392	⁵ BAGNASCO 02	E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow J/\psi\gamma$
16.6 ^{+5.2} _{-3.7} ^{+0.1}		AMBROGIANI 99B	E835	$\bar{p}p \rightarrow e^+ e^- \gamma$
14.3 ± 2.0 ± 3.0		BAI 98I	BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$
13.5 ± 3.3 ± 4.2		GAISER 86	CBAL	$\psi(2S) \rightarrow \gamma X, \gamma\pi^0\pi^0$

5 Recalculated by ANDREOTTI 05A.

NODE=M056W

NODE=M056W

NEW

NODE=M056W;LINKAGE=AN

NODE=M056215;NODE=M056

 $\chi_{c0}(1P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Hadronic decays		
Γ_1 $2(\pi^+\pi^-)$	(2.25 ± 0.19) %	
Γ_2 $\rho^0\pi^+\pi^-$	(8.8 ± 2.8) × 10 ⁻³	
Γ_3 $\rho^0\rho^0$		
Γ_4 $f_0(980)f_0(980)$	(6.6 ± 2.1) × 10 ⁻⁴	
Γ_5 $\pi^+\pi^-\pi^0\pi^0$	(3.3 ± 0.4) %	
Γ_6 $\rho^+\pi^-\pi^0 + \text{c.c.}$	(2.8 ± 0.4) %	
Γ_7 $4\pi^0$	(3.3 ± 0.4) × 10 ⁻³	
Γ_8 $\pi^+\pi^-K^+K^-$	(1.77 ± 0.15) %	
Γ_9 $K_0^*(1430)^0\bar{K}_0^*(1430)^0 \rightarrow \pi^+\pi^-K^+K^-$	(9.8 ± 4.0) × 10 ⁻⁴	
Γ_{10} $K_0^*(1430)^0\bar{K}_2^*(1430)^0 + \text{c.c.} \rightarrow \pi^+\pi^-K^+K^-$	(8.0 ± 2.0) × 10 ⁻⁴	
Γ_{11} $K_1(1270)^+K^- + \text{c.c.} \rightarrow \pi^+\pi^-K^+K^-$	(6.2 ± 1.9) × 10 ⁻³	

NODE=M056;CLUMP=A

DESIG=3

DESIG=9

DESIG=54

DESIG=20

DESIG=61

DESIG=62

DESIG=70

DESIG=5

DESIG=31

DESIG=32

DESIG=33

Γ_{12}	$K_1(1400)^+ K^- + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-$	$< 2.7 \times 10^{-3}$	CL=90%	DESIG=34
Γ_{13}	$f_0(980) f_0(980)$	$(1.6 \begin{array}{l} +1.0 \\ -0.9 \end{array}) \times 10^{-4}$		DESIG=23
Γ_{14}	$f_0(980) f_0(2200)$	$(7.9 \begin{array}{l} +2.0 \\ -2.5 \end{array}) \times 10^{-4}$		DESIG=24
Γ_{15}	$f_0(1370) f_0(1370)$	$< 2.7 \times 10^{-4}$	CL=90%	DESIG=25
Γ_{16}	$f_0(1370) f_0(1500)$	$< 1.7 \times 10^{-4}$	CL=90%	DESIG=26
Γ_{17}	$f_0(1370) f_0(1710)$	$(6.7 \begin{array}{l} +3.5 \\ -2.3 \end{array}) \times 10^{-4}$		DESIG=27
Γ_{18}	$f_0(1500) f_0(1370)$	$< 1.3 \times 10^{-4}$	CL=90%	DESIG=28
Γ_{19}	$f_0(1500) f_0(1500)$	$< 5 \times 10^{-5}$	CL=90%	DESIG=29
Γ_{20}	$f_0(1500) f_0(1710)$	$< 7 \times 10^{-5}$	CL=90%	DESIG=30
Γ_{21}	$K^+ K^- \pi^+ \pi^- \pi^0$	$(1.12 \pm 0.27) \%$		DESIG=75
Γ_{22}	$K^+ K^- \pi^0 \pi^0$	$(5.5 \pm 0.9) \times 10^{-3}$		DESIG=63
Γ_{23}	$K^+ \pi^- K^0 \pi^0 + \text{c.c.}$	$(2.47 \pm 0.33) \%$		DESIG=65
Γ_{24}	$\rho^+ K^- K^0 + \text{c.c.}$	$(1.20 \pm 0.21) \%$		DESIG=66
Γ_{25}	$K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.}$	$(4.6 \pm 1.2) \times 10^{-3}$		DESIG=67
Γ_{26}	$K_S^0 K_S^0 \pi^+ \pi^-$	$(5.7 \pm 1.1) \times 10^{-3}$		DESIG=41
Γ_{27}	$K^+ K^- \eta \pi^0$	$(3.0 \pm 0.7) \times 10^{-3}$		DESIG=68
Γ_{28}	$3(\pi^+ \pi^-)$	$(1.20 \pm 0.18) \%$		DESIG=4
Γ_{29}	$K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}$	$(7.3 \pm 1.6) \times 10^{-3}$		DESIG=10
Γ_{30}	$K^*(892)^0 \bar{K}^*(892)^0$	$(1.7 \pm 0.6) \times 10^{-3}$		DESIG=21
Γ_{31}	$\pi \pi$	$(8.5 \pm 0.4) \times 10^{-3}$		DESIG=18
Γ_{32}	$\pi^0 \eta$	$< 1.9 \times 10^{-4}$		DESIG=35
Γ_{33}	$\pi^0 \eta'$	$< 1.2 \times 10^{-3}$		DESIG=36
Γ_{34}	$\eta \eta$	$(3.01 \pm 0.20) \times 10^{-3}$		DESIG=13
Γ_{35}	$\eta \eta'$	$< 2.3 \times 10^{-4}$	CL=90%	DESIG=37
Γ_{36}	$\eta' \eta'$	$(1.99 \pm 0.22) \times 10^{-3}$		DESIG=46
Γ_{37}	$\omega \omega$	$(9.6 \pm 1.1) \times 10^{-4}$		DESIG=22
Γ_{38}	$\omega \phi$	$(1.17 \pm 0.22) \times 10^{-4}$		DESIG=76
Γ_{39}	$K^+ K^-$	$(5.98 \pm 0.34) \times 10^{-3}$		DESIG=2
Γ_{40}	$K_S^0 K_S^0$	$(3.10 \pm 0.18) \times 10^{-3}$		DESIG=15
Γ_{41}	$\pi^+ \pi^- \eta$	$< 2.0 \times 10^{-4}$	CL=90%	DESIG=50
Γ_{42}	$\pi^+ \pi^- \eta'$	$< 4 \times 10^{-4}$	CL=90%	DESIG=53
Γ_{43}	$\bar{K}^0 K^+ \pi^- + \text{c.c.}$	$< 9 \times 10^{-5}$	CL=90%	DESIG=17
Γ_{44}	$K^+ K^- \pi^0$	$< 6 \times 10^{-5}$	CL=90%	DESIG=47
Γ_{45}	$K^+ K^- \eta$	$< 2.2 \times 10^{-4}$	CL=90%	DESIG=51
Γ_{46}	$K^+ K^- K_S^0 K_S^0$	$(1.4 \pm 0.5) \times 10^{-3}$		DESIG=42
Γ_{47}	$K^+ K^- K^+ K^-$	$(2.77 \pm 0.29) \times 10^{-3}$		DESIG=14
Γ_{48}	$K^+ K^- \phi$	$(9.6 \pm 2.5) \times 10^{-4}$		DESIG=44
Γ_{49}	$\phi \phi$	$(7.9 \pm 0.8) \times 10^{-4}$		DESIG=16
Γ_{50}	$p \bar{p}$	$(2.13 \pm 0.12) \times 10^{-4}$		DESIG=11
Γ_{51}	$p \bar{p} \pi^0$	$(6.9 \pm 0.7) \times 10^{-4}$	S=1.2	DESIG=48
Γ_{52}	$p \bar{p} \eta$	$(3.5 \pm 0.4) \times 10^{-4}$		DESIG=52
Γ_{53}	$p \bar{p} \omega$	$(5.2 \pm 0.6) \times 10^{-4}$		DESIG=69
Γ_{54}	$p \bar{p} \phi$	$(6.0 \pm 1.4) \times 10^{-5}$		DESIG=74
Γ_{55}	$p \bar{p} \pi^+ \pi^-$	$(2.1 \pm 0.7) \times 10^{-3}$	S=1.4	DESIG=8
Γ_{56}	$p \bar{p} \pi^0 \pi^0$	$(1.03 \pm 0.28) \times 10^{-3}$		DESIG=64
Γ_{57}	$p \bar{p} K^+ K^- (\text{non-resonant})$	$(1.21 \pm 0.26) \times 10^{-4}$		DESIG=71
Γ_{58}	$p \bar{p} K_S^0 K_S^0$	$< 8.8 \times 10^{-4}$	CL=90%	DESIG=40
Γ_{59}	$p \bar{n} \pi^-$	$(1.12 \pm 0.31) \times 10^{-3}$		DESIG=43
Γ_{60}	$\Lambda \bar{\Lambda}$	$(3.3 \pm 0.4) \times 10^{-4}$		DESIG=19
Γ_{61}	$\Lambda \bar{\Lambda} \pi^+ \pi^-$	$< 4.0 \times 10^{-3}$	CL=90%	DESIG=38
Γ_{62}	$K^+ \bar{p} \Lambda + \text{c.c.}$	$(1.24 \pm 0.12) \times 10^{-3}$	S=1.3	DESIG=49
Γ_{63}	$K^+ p \Lambda(1520) + \text{c.c.}$	$(2.9 \pm 0.7) \times 10^{-4}$		DESIG=72
Γ_{64}	$\Lambda(1520) \bar{\Lambda}(1520)$	$(3.1 \pm 1.2) \times 10^{-4}$		DESIG=73
Γ_{65}	$\Sigma^0 \bar{\Sigma}^0$	$(4.1 \pm 0.7) \times 10^{-4}$		DESIG=58
Γ_{66}	$\Sigma^+ \bar{\Sigma}^-$	$(3.0 \pm 0.7) \times 10^{-4}$		DESIG=59
Γ_{67}	$\Xi^0 \bar{\Xi}^0$	$(3.1 \pm 0.8) \times 10^{-4}$		DESIG=60
Γ_{68}	$\Xi^- \bar{\Xi}^+$	$(4.8 \pm 0.7) \times 10^{-4}$		DESIG=39

Radiative decays

Γ_{69}	$\gamma J/\psi(1S)$	(1.30 ± 0.07) %		
Γ_{70}	$\gamma\rho^0$	< 9	$\times 10^{-6}$	CL=90%
Γ_{71}	$\gamma\omega$	< 8	$\times 10^{-6}$	CL=90%
Γ_{72}	$\gamma\phi$	< 6	$\times 10^{-6}$	CL=90%
Γ_{73}	$\gamma\gamma$	(2.25 ± 0.17)	$\times 10^{-4}$	

NODE=M056;CLUMP=B
DESIG=6
DESIG=55
DESIG=56
DESIG=57
DESIG=7

CONSTRAINED FIT INFORMATION

A multiparticle fit to $\chi_{c1}(1P)$, $\chi_{c0}(1P)$, $\chi_{c2}(1P)$, and $\psi(2S)$ with 4 total widths, a partial width, 25 combinations of partial widths obtained from integrated cross section, and 84 branching ratios uses 227 measurements to determine 49 parameters. The overall fit has a $\chi^2 = 325.4$ for 178 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$.

x_2	26								
x_8	19	5							
x_{29}	9	2	30						
x_{31}	22	6	23	8					
x_{34}	13	3	14	5	28				
x_{39}	19	5	20	7	35	23			
x_{40}	21	6	21	8	34	22	29		
x_{47}	12	3	12	5	19	12	16	16	
x_{49}	14	4	13	5	20	13	17	17	10
x_{50}	-1	0	-1	0	-11	-10	-3	-2	-1
x_{60}	8	2	9	3	17	11	14	13	7
x_{69}	10	3	11	4	26	18	19	18	10
x_{73}	-24	-6	-17	-10	-9	-4	-10	-14	-8
Γ	-14	-4	-11	-5	-13	-8	-11	-13	-7
	x_1	x_2	x_8	x_{29}	x_{31}	x_{34}	x_{39}	x_{40}	x_{47}
									x_{49}
x_{60}		-1							
x_{69}		-40	9						
x_{73}		-2	-3	3					
Γ		3	-5	-11	-59				
	x_{50}	x_{60}	x_{69}	x_{73}					

 $\chi_{c0}(1P)$ PARTIAL WIDTHS

$$\chi_{c0}(1P) \Gamma(i) \Gamma(\gamma J/\psi(1S)) / \Gamma(\text{total})$$

$\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S)) / \Gamma_{\text{total}}$	$\Gamma_{50}\Gamma_{69} / \Gamma$
VALUE (eV)	EVTS DOCUMENT ID TECHN COMMENT

NODE=M056217

NODE=M056223

NODE=M056G1
NODE=M056G1
NEW

 $\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S)) / \Gamma_{\text{total}}$ [27.1 ± 2.4 eV OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

$26.6 \pm 2.6 \pm 1.4$	392	^{6,7} BAGNASCO	02	E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow J/\psi\gamma$
$48.7^{+11.3}_{-8.9} \pm 2.4$		^{6,7} AMBROGIANI	99B	E835	$\bar{p}p \rightarrow \gamma J/\psi$

⁶ Calculated by us using $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0593 \pm 0.0010$.

⁷ Values in $(\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S)) / \Gamma_{\text{total}})$ and $(\Gamma(p\bar{p}) / \Gamma_{\text{total}} \times \Gamma(\gamma J/\psi(1S)) / \Gamma_{\text{total}})$ are not independent. The latter is used in the fit since it is less correlated to the total width.

NODE=M056G;LINKAGE=7A

NODE=M056G;LINKAGE=KS

$\chi_{c0}(1P) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_1\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
52 ± 4 OUR FIT				
49 ± 10 OUR AVERAGE		Error includes scale factor of 1.8.		

44.7 ± 3.6 ± 4.9 3.6k UEHARA 08 BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow 2(\pi^+\pi^-)$
 75 ± 13 ± 8 EISENSTEIN 01 CLE2 $e^+e^- \rightarrow e^+e^-\chi_{c0}$

$\Gamma(\rho^0\rho^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_3\Gamma_{73}/\Gamma$			
VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<12	90	<252	UEHARA	08	BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow 2(\pi^+\pi^-)$

$\Gamma(\pi^+\pi^-K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_8\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
41 ± 4 OUR FIT				
38.8 ± 3.7 ± 4.7	1.7k	UEHARA	08	BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow K^+K^-\pi^+\pi^-$

$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{21}\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
26 ± 4 ± 4	1094	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$

$\Gamma(K^+\bar{K}^*(892)^0\pi^- + \text{c.c.}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{29}\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
17 ± 4 OUR FIT				
16.7 ± 6.1 ± 3.0	495 ± 182	UEHARA	08	BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow K^+K^-\pi^+\pi^-$

$\Gamma(K^*(892)^0\bar{K}^*(892)^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{30}\Gamma_{73}/\Gamma$			
VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<6	90	<148	UEHARA	08	BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow K^+K^-\pi^+\pi^-$

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{31}\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
19.6 ± 1.4 OUR FIT				
[19.7 ± 1.4 eV OUR 2012 FIT]				
23 ± 5 OUR AVERAGE				

29.7 ^{+17.4} _{-12.0} ± 4.8	103 ⁺⁶⁰ ₋₄₂	8	UEHARA	09	BELL $e^+e^- \rightarrow e^+e^-\pi^0\pi^0$
22.7 ± 3.2 ± 3.5	129 ± 18	9	NAKAZAWA	05	BELL $e^+e^- \rightarrow e^+e^-\pi^+\pi^-$

8 We multiplied the measurement by 3 to convert from $\pi^0\pi^0$ to $\pi\pi$. Interference with the continuum included.
 9 We have multiplied $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.

$\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{34}\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
9.4 ± 2.3 ± 1.2	22	10	UEHARA	10A BELL $10.6 e^+e^- \rightarrow e^+e^-\eta\eta$

10 Interference with the continuum not included.

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{37}\Gamma_{73}/\Gamma$		
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<3.9 90 11 LIU 12B BELL $\gamma\gamma \rightarrow 2(\pi^+\pi^-\pi^0)$				

11 Using $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$.

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{38}\Gamma_{73}/\Gamma$		
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.34 90 12 LIU 12B BELL $\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$				

12 Using $B(\phi \rightarrow K^+K^-) = (48.9 \pm 0.5)\%$ and $B(\omega \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7)\%$.

$\Gamma(K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{39}\Gamma_{73}/\Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
13.9 ± 1.1 OUR FIT				
[14.0 ± 1.1 eV OUR 2012 FIT]				

14.3 ± 1.6 ± 2.3 153 ± 17 NAKAZAWA 05 BELL $10.6 e^+e^- \rightarrow e^+e^-K^+K^-$

NODE=M056224

NODE=M056G2

NODE=M056G2

NODE=M056G08
NODE=M056G08

NODE=M056G09
NODE=M056G09

NODE=M056G3;LINKAGE=UE
NODE=M056G;LINKAGE=NA

NODE=M056G06;LINKAGE=UE

NODE=M056G02
NODE=M056G02

NODE=M056G03;LINKAGE=LI

NODE=M056G4
NODE=M056G4
NEW

$\Gamma(K_S^0 K_S^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_{40}\Gamma_{73}/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
7.2 ± 0.5 OUR FIT [7.3 ± 0.5 eV OUR 2012 FIT]					NODE=M056G5 NODE=M056G5 NEW
7.00±0.65±0.71	134 ± 12	CHEN	07B BELL	$e^+ e^- \rightarrow e^+ e^- \chi_{c0}$	
$\Gamma(K^+ K^- K^+ K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_{47}\Gamma_{73}/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
6.4±0.7 OUR FIT					NODE=M056G11 NODE=M056G11
7.9±1.3±1.1	215 ± 36	UEHARA	08	BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow 2(K^+ K^-)$	
$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					$\Gamma_{49}\Gamma_{73}/\Gamma$
<u>VALUE (eV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.82±0.19 OUR FIT [1.89 ± 0.22 eV OUR 2012 FIT]					NODE=M056G12 NODE=M056G12 NEW
1.7 ± 0.4 OUR AVERAGE [2.3 ± 1.0 eV OUR 2012 AVERAGE]					NEW
1.72±0.33±0.14	56 ± 11	13 LIU	12B BELL	$\gamma\gamma \rightarrow 2(K^+ K^-)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.3 ± 0.9	23.6 ± 9.6	UEHARA	08	BELL $\gamma\gamma \rightarrow \chi_{c0} \rightarrow 2(K^+ K^-)$	
13 Supersedes UEHARA 08. Using $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$.					
$\chi_{c0}(1P)$ BRANCHING RATIOS					
———— HADRONIC DECAYS ——					
$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$					Γ_1/Γ
<u>VALUE</u>		<u>DOCUMENT ID</u>			
0.0225±0.0019 OUR FIT [0.0226 ± 0.0019 OUR 2012 FIT]					NODE=M056R2 NODE=M056R2 NEW
$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$					Γ_2/Γ_1
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.39±0.12 OUR FIT					NODE=M056R54 NODE=M056R54
0.39±0.12		TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c0}$	
$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_2/Γ
<u>VALUE</u>		<u>DOCUMENT ID</u>			
0.0088±0.0028 OUR FIT					NODE=M056R9 NODE=M056R9
$\Gamma(f_0(980)f_0(980))/\Gamma_{\text{total}}$					Γ_4/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
6.6±2.1 OUR AVERAGE [(6.7 ± 2.1) × 10^{-4} OUR 2012 AVERAGE]					NODE=M056R24 NODE=M056R24 NEW
6.6±2.1±0.2	36 ± 9	14 ABLIKIM	04G BES	$\psi(2S) \rightarrow \gamma 2\pi^+ 2\pi^-$	
14 ABLIKIM 04G reports $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(980)f_0(980))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (6.5 \pm 1.6 \pm 1.3) \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$					Γ_5/Γ
<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.3±0.4 OUR AVERAGE [(3.4 ± 0.4)% OUR 2012 AVERAGE]					NODE=M056R62 NODE=M056R62 NEW
3.3±0.4±0.1	1751.4	15 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
15 HE 08B reports $3.54 \pm 0.10 \pm 0.43 \pm 0.18 \%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(\rho^+\pi^-\pi^0+c.c.)/\Gamma_{\text{total}}$					Γ_6/Γ
<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.8±0.4 OUR AVERAGE [(2.9 ± 0.4)% OUR 2012 AVERAGE]					NODE=M056R63 NODE=M056R63 NEW
2.8±0.4±0.1	1358.5	16,17 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
16 HE 08B reports $3.04 \pm 0.18 \pm 0.42 \pm 0.16 \%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \rho^+\pi^-\pi^0 + c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
17 Calculated by us. We have added the values from HE 08B for $\rho^+\pi^-\pi^0$ and $\rho^-\pi^+\pi^0$ decays assuming uncorrelated statistical and fully correlated systematic uncertainties.					

$\Gamma(4\pi^0)/\Gamma_{\text{total}}$	Γ_7/Γ			
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
3.3±0.4±0.1	3296	18 ABLIKIM	11A BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma \chi_{c0}$
18 ABLIKIM 11A reports $(3.34 \pm 0.06 \pm 0.44) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow 4\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

$\Gamma(\pi^+\pi^- K^+K^-)/\Gamma_{\text{total}}$ Γ_8/Γ
VALUE (units 10^{-3}) DOCUMENT ID
17.7 ± 1.5 OUR FIT
 $[(17.9 \pm 1.5) \times 10^{-3} \text{ OUR 2012 FIT}]$

$\Gamma(K+K^*(892)^0\pi^- + \text{c.c.})/\Gamma(\pi^+\pi^-K^+K^-)$	Γ_{29}/Γ_8		
VALUE	DOCUMENT ID	TECN	COMMENT
0.41±0.09 OUR FIT			
0.41±0.10	TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma\chi_{c0}$

$\Gamma(K_0^*(1430)^0 \bar{K}_0^*(1430)^0 \rightarrow \pi^+ \pi^- K^+ K^-) / \Gamma_{\text{total}}$	Γ_9 / Γ			
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
9.8^{+4.0}_{-2.8} OUR AVERAGE	$[(9.9^{+4.0}_{-2.9}) \times 10^{-4}$ OUR 2012 AVERAGE]			
9.8 ^{+3.6} _{-2.8} ± 0.3	83	¹⁹ ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$

¹⁹ ABLIKIM 05Q reports $(10.44 \pm 2.37^{+3.05}_{-1.90}) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K_0^*(1430)^0 \bar{K}_0^*(1430)^0 \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K_0^*(1430)^0 \bar{K}_2^*(1430)^0 + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}$	Γ_{10}/Γ			
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$8.0^{+2.0}_{-2.4}$ OUR AVERAGE	$[(8.1^{+2.0}_{-2.4}) \times 10^{-4}$ OUR 2012 AVERAGE]			
± 1.0				

²⁰ ABLIKIM 05Q reports $(8.49 \pm 1.66^{+1.32}_{-1.99}) \times 10^{-4}$ from a measurement of $[F(\chi_{c0}(1P) \rightarrow K_0^*(1430)^0 \bar{K}_2^*(1430)^0 + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-)] / \Gamma_{\text{total}} \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K_1(1270)^+ K^- + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}$	Γ_{11}/Γ			
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
6.2 ± 1.9 OUR AVERAGE	$[(6.3 \pm 1.9) \times 10^{-3}$ OUR 2012 AVERAGE]			
$6.2^{+1.9}_{-1.8} \pm 0.2$	68	²¹ ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$

21 ABLIKIM 05Q reports $(6.66 \pm 1.31)^{+1.60}_{-1.51} \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K_1(1270)^+ K^- + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. The measurement assumes $B(K_1(1270) \rightarrow K \rho(770)) = 42 \pm 6\%$.

$\Gamma(K_1(1400)^+ K^- + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}$	Γ_{12}/Γ			
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.7	90	22 ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$
22 ABLIKIM 05Q reports $< 2.85 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K_1(1400)^+ K^- + \text{c.c.} \rightarrow \pi^+ \pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$. The measurement assumes $B(K_1(1400) \rightarrow K^*(892)\pi) = 94 \pm 6\%$.				

NODE=M056R71
NODE=M056R71

NODE=M056R71;LINKAGE=AB

NODE=M056R3
NODE=M056R3
NEW

NODE=M056R55
NODE=M056R55

NODE=M056R36
NODE=M056R36

NEW

NODE=M056R36;LINKAGE=AB

NODE=M056R37
NODE=M056R37

NEW

NODE=M056R37;LINKAGE=AB

NODE=M056R38
NODE=M056R38

NEW

NODE=M056R38:LINKAGE=AB

NODE=M056R39
NODE_M056R39

NODE=M056R39;LINKAGE=AB

$\Gamma(f_0(980)f_0(980))/\Gamma_{\text{total}}$					Γ_{13}/Γ	
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT		NODE=M056R28 NODE=M056R28
16^{+10}_{-9} OUR AVERAGE		$[(16^{+11}_{-9}) \times 10^{-5}$ OUR 2012 AVERAGE]				
$16^{+10}_{-9} \pm 1$	28	23	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$	NEW
23 ABLIKIM 05Q reports $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(980)f_0(980))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (1.59 \pm 0.50^{+0.89}_{-0.72}) \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. One of the $f_0(980)$ mesons is identified via decay to $\pi^+\pi^-$ while the other via K^+K^- decay.						NODE=M056R28;LINKAGE=AB
$\Gamma(f_0(980)f_0(2200))/\Gamma_{\text{total}}$					Γ_{14}/Γ	
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT		NODE=M056R29 NODE=M056R29
$7.9^{+2.0}_{-2.5}$ OUR AVERAGE		$[(8.0^{+2.0}_{-2.5}) \times 10^{-4}$ OUR 2012 AVERAGE]				
$7.9^{+2.0}_{-2.5} \pm 0.2$	77	24	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$	NEW
24 ABLIKIM 05Q reports $(8.42 \pm 1.42^{+1.65}_{-2.29}) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(980)f_0(2200))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. The f_0 mesons are identified via $f_0(980) \rightarrow \pi^+\pi^-$ and $f_0(2200) \rightarrow K^+K^-$ decays.						NODE=M056R29;LINKAGE=AB
$\Gamma(f_0(1370)f_0(1370))/\Gamma_{\text{total}}$					Γ_{15}/Γ	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT		NODE=M056R30 NODE=M056R30
<2.7 (CL = 90%)		$[<2.8 \times 10^{-4} (\text{CL} = 90\%) \text{ OUR 2012 BEST LIMIT}]$				
<2.7	90	25	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$	
25 ABLIKIM 05Q reports $< 2.9 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(1370)f_0(1370))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. One of the $f_0(1370)$ mesons is identified via decay to $\pi^+\pi^-$ while the other via K^+K^- decay. Both branching fractions for these f_0 decays are implicitly included in the quoted result.						NODE=M056R30;LINKAGE=AB
$\Gamma(f_0(1370)f_0(1500))/\Gamma_{\text{total}}$					Γ_{16}/Γ	
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT		NODE=M056R31 NODE=M056R31
<1.7	90	26	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$	
26 ABLIKIM 05Q reports $< 1.8 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(1370)f_0(1500))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. The f_0 mesons are identified via $f_0(1370) \rightarrow \pi^+\pi^-$ and $f_0(1500) \rightarrow K^+K^-$ decays. Both branching fractions for these f_0 decays are implicitly included in the quoted result.						NODE=M056R31;LINKAGE=AB
$\Gamma(f_0(1370)f_0(1710))/\Gamma_{\text{total}}$					Γ_{17}/Γ	
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT		NODE=M056R32 NODE=M056R32
$6.7^{+3.5}_{-2.3}$ OUR AVERAGE		$[(6.8^{+4.0}_{-2.4}) \times 10^{-4}$ OUR 2012 AVERAGE]				
$6.7^{+3.5}_{-2.3} \pm 0.2$	61	27	ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$	NEW
27 ABLIKIM 05Q reports $(7.12 \pm 1.85^{+3.28}_{-1.68}) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(1370)f_0(1710))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. The f_0 mesons are identified via $f_0(1370) \rightarrow \pi^+\pi^-$ and $f_0(1710) \rightarrow K^+K^-$ decays. Both branching fractions for these f_0 decays are implicitly included in the quoted result.						NODE=M056R32;LINKAGE=AB

$\Gamma(f_0(1500)f_0(1370))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<1.3	90	28 ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$
28 ABLIKIM 05Q reports $< 1.4 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(1500)f_0(1370))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. The f_0 mesons are identified via $f_0(1500) \rightarrow \pi^+\pi^-$ and $f_0(1370) \rightarrow K^+K^-$ decays. Both branching fractions for these f_0 decays are implicitly included in the quoted result.				

 Γ_{18}/Γ

NODE=M056R33
NODE=M056R33

NODE=M056R33;LINKAGE=AB

 $\Gamma(f_0(1500)f_0(1500))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<0.5	90	29 ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$
29 ABLIKIM 05Q reports $< 0.55 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(1500)f_0(1500))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. One of the $f_0(1500)$ is identified via decay to $\pi^+\pi^-$ while the other via K^+K^- decay. Both branching fractions for these f_0 decays are implicitly included in the quoted result.				

 Γ_{19}/Γ

NODE=M056R34
NODE=M056R34

NODE=M056R34;LINKAGE=AB

 $\Gamma(f_0(1500)f_0(1710))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<0.7	90	30 ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-$
30 ABLIKIM 05Q reports $< 0.73 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow f_0(1500)f_0(1710))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. The f_0 mesons are identified via $f_0(1500) \rightarrow \pi^+\pi^-$ and $f_0(1710) \rightarrow K^+K^-$ decays. Both branching fractions for these f_0 decays are implicitly included in the quoted result.				

 Γ_{20}/Γ

NODE=M056R35
NODE=M056R35

NODE=M056R35;LINKAGE=AB

 $\Gamma(K^+K^-\pi^0\pi^0)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.55±0.09 OUR AVERAGE				$[(0.56 \pm 0.09)\% \text{ OUR 2012 AVERAGE}]$
0.55±0.09±0.02	213.5	31 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$
31 HE 08B reports $0.59 \pm 0.05 \pm 0.08 \pm 0.03 \%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+K^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{22}/Γ

NODE=M056R64
NODE=M056R64

NEW

NODE=M056R64;LINKAGE=HE

 $\Gamma(K^+\pi^-\kappa^0\pi^0+c.c.)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
2.47±0.33 OUR AVERAGE				$[(2.52 \pm 0.34)\% \text{ OUR 2012 AVERAGE}]$
2.47±0.32±0.08	401.7	32 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$
32 HE 08B reports $2.64 \pm 0.15 \pm 0.31 \pm 0.14 \%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+\pi^-\kappa^0\pi^0+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{23}/Γ

NODE=M056R66
NODE=M056R66

NEW

NODE=M056R66;LINKAGE=HE

 $\Gamma(\rho^+K^-K^0+c.c.)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
1.20±0.21 OUR AVERAGE				$[(1.22 \pm 0.21)\% \text{ OUR 2012 AVERAGE}]$
1.20±0.21±0.04	179.7	33 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$
33 HE 08B reports $1.28 \pm 0.16 \pm 0.15 \pm 0.07 \%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \rho^+K^-K^0+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{24}/Γ

NODE=M056R67
NODE=M056R67

NEW

NODE=M056R67;LINKAGE=HE

$\Gamma(K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{25}/Γ

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.46±0.12 OUR AVERAGE		$[(0.47 \pm 0.12)\% \text{ OUR 2012 AVERAGE}]$		
0.46±0.12±0.01	64.1	34 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

34 HE 08B reports $0.49 \pm 0.10 \pm 0.07 \pm 0.03\%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K_S^0 K_S^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{26}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
5.7±1.1 OUR AVERAGE		$[(5.8 \pm 1.1) \times 10^{-3} \text{ OUR 2012 AVERAGE}]$		
5.7±1.0±0.2	152 ± 14	35 ABLIKIM	050 BES2	$\psi(2S) \rightarrow \gamma \chi_{c0}$

35 ABLIKIM 050 reports $[\Gamma(\chi_{c0}(1P) \rightarrow K_S^0 K_S^0 \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (0.558 \pm 0.051 \pm 0.089) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}$ Γ_{27}/Γ

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
0.30±0.07±0.01	56.4	36 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

36 HE 08B reports $0.32 \pm 0.05 \pm 0.05 \pm 0.02\%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$ Γ_{28}/Γ

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
12.0±1.8 OUR EVALUATION	Treating systematic error as correlated.		
12.0±1.7 OUR AVERAGE			

11.7±1.0±1.9
12.5±2.9±0.5

37 BAI 99B BES $\psi(2S) \rightarrow \gamma \chi_{c0}$
37 TANENBAUM 78 MRK1 $\psi(2S) \rightarrow \gamma \chi_{c0}$

37 Rescaled by us using $B(\psi(2S) \rightarrow \gamma \chi_{c0}) = (9.4 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.6 \pm 0.5)\%$.

 $\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{29}/Γ

VALUE	DOCUMENT ID
0.0073±0.0016 OUR FIT	

 $\Gamma(K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$ Γ_{30}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.7 ± 0.6 ± 0.1	64	38 ABLIKIM	05Q BES2	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.56±0.40±0.05 30.1±5.7 39,40 ABLIKIM 04H BES Repl. by ABLIKIM 05Q

38 ABLIKIM 05Q reports $[\Gamma(\chi_{c0}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (0.168 \pm 0.035^{+0.047}_{-0.040}) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

39 Assumes $B(K^*(892)^0 \rightarrow K^- \pi^+) = 2/3$.

40 ABLIKIM 04H reports $[\Gamma(\chi_{c0}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (1.53 \pm 0.29 \pm 0.26) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\pi\pi)/\Gamma_{\text{total}}$ Γ_{31}/Γ

VALUE (units 10^{-3})	DOCUMENT ID
8.5±0.4 OUR FIT	

 $\Gamma(\eta\eta)/\Gamma_{\text{total}}$ Γ_{34}/Γ

VALUE (units 10^{-3})	DOCUMENT ID
3.01±0.20 OUR FIT	$[(3.03 \pm 0.21) \times 10^{-3} \text{ OUR 2012 FIT}]$

NODE=M056R68

NODE=M056R68

NEW

NODE=M056R68;LINKAGE=HE

NODE=M056R47

NODE=M056R47

NEW

NODE=M056R47;LINKAGE=AB

NODE=M056R69

NODE=M056R69

NODE=M056R69;LINKAGE=HE

NODE=M056R4

NODE=M056R4

→ UNCHECKED ←

NODE=M056R;LINKAGE=X1

NODE=M056R10

NODE=M056R10

NODE=M056R26

NODE=M056R26

NODE=M056R26;LINKAGE=AI

NODE=M056R;LINKAGE=AL

NODE=M056R26;LINKAGE=AB

NODE=M056R22

NODE=M056R22

NODE=M056R13

NODE=M056R13

NEW

$\Gamma(\eta\eta)/\Gamma(\pi\pi)$

VALUE

DOCUMENT ID

TECN COMMENT

0.356±0.025 OUR FIT

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.26 ± 0.09	+0.03 -0.02	41 ANDREOTTI	05C E835	$\bar{p}p \rightarrow$ 2 mesons
0.24 ± 0.10	± 0.08	41 BAI	03C BES	$\psi(2S) \rightarrow 5\gamma$

41 We have multiplied $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$. Γ_{34}/Γ_{31}

NODE=M056R20

NODE=M056R20

 $\Gamma(\eta\eta')/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

CL%

EVTS

DOCUMENT ID

TECN

COMMENT

<0.23 (CL = 90%) [$<0.24 \times 10^{-3}$ (CL = 90%) OUR 2012 BEST LIMIT]**<0.23** 90 35 ± 13 42 ASNER 09 CLEO $\psi(2S) \rightarrow \gamma\eta'\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.5	90	43 ADAMS	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c0}$
42 ASNER 09 reports $< 0.25 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \eta\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$.				
43 Superseded by ASNER 09. ADAMS 07 reports $< 0.5 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \eta\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$.				

 Γ_{35}/Γ

NODE=M056R03

NODE=M056R03

 $\Gamma(\eta'\eta')/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

EVTS

DOCUMENT ID

TECN

COMMENT

1.99±0.22 OUR AVERAGE [$(2.02 \pm 0.22) \times 10^{-3}$ OUR 2012 AVERAGE]**1.99±0.21±0.06** 0.4k 44 ASNER 09 CLEO $\psi(2S) \rightarrow \gamma\eta'\eta'$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.59 ± 0.41 ± 0.05	23	45 ADAMS	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c0}$
44 ASNER 09 reports $(2.12 \pm 0.13 \pm 0.21) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \eta'\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				
45 Superseded by ASNER 09. ADAMS 07 reports $(1.7 \pm 0.4 \pm 0.2) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \eta'\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 0.0922 \pm 0.0011 \pm 0.0046$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{36}/Γ

NODE=M056R04

NODE=M056R04

NEW

 $\Gamma(\omega\omega)/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

EVTS

DOCUMENT ID

TECN

COMMENT

0.96±0.11 OUR AVERAGE[(0.98 ± 0.11) × 10⁻³ OUR 2012 AVERAGE]

0.93 ± 0.11 ± 0.03	991	46 ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons
2.2 ± 0.7 ± 0.1	38.1 ± 9.6	47 ABLIKIM	05N BES2	$\psi(2S) \rightarrow \gamma\chi_{c0} \rightarrow \gamma 6\pi$
46 ABLIKIM 11K reports $(0.95 \pm 0.03 \pm 0.11) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				
47 ABLIKIM 05N reports $[\Gamma(\chi_{c0}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (0.212 \pm 0.053 \pm 0.037) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{37}/Γ

NODE=M056R27

NODE=M056R27

NEW

NODE=M056R27;LINKAGE=AL

 $\Gamma(\omega\phi)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

EVTS

DOCUMENT ID

TECN

COMMENT

1.17±0.22 OUR AVERAGE [(1.19 ± 0.22) × 10⁻⁴ OUR 2012 AVERAGE]**1.17±0.22±0.04** 76 48 ABLIKIM 11K BES3 $\psi(2S) \rightarrow \gamma$ hadrons

48 ABLIKIM 11K reports $(1.2 \pm 0.1 \pm 0.2) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \omega\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				
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 Γ_{38}/Γ

NODE=M056R76

NODE=M056R76

NEW

NODE=M056R76;LINKAGE=AL

$\Gamma(K^+K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
5.98 ± 0.34 OUR FIT [(6.06 ± 0.35) $\times 10^{-3}$ OUR 2012 FIT]	

 Γ_{39}/Γ

NODE=M056R6

NODE=M056R6

NEW

 $\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
3.10 ± 0.18 OUR FIT [(3.14 ± 0.18) $\times 10^{-3}$ OUR 2012 FIT]	

 Γ_{40}/Γ

NODE=M056R15

NODE=M056R15

NEW

 $\Gamma(K_S^0 K_S^0)/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.367 ± 0.022 OUR FIT [0.369 ± 0.022 OUR 2012 FIT]			• • • We do not use the following data for averages, fits, limits, etc. • • •

 Γ_{40}/Γ_{31}

NODE=M056R53

NODE=M056R53

NEW

 $\Gamma(K_S^0 K_S^0)/\Gamma(K^+K^-)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.519 ± 0.035 OUR FIT			• • • We do not use the following data for averages, fits, limits, etc. • • •

 Γ_{40}/Γ_{39} $\Gamma(\pi^+\pi^-\eta)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.20	90	53 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1.0	90	54 ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma \chi_{c0}$

53 ATHAR 07 reports $< 0.21 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \pi^+ \pi^- \eta) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$.54 ABLIKIM 06R reports $< 1.1 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \pi^+ \pi^- \eta) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$. Γ_{41}/Γ $\Gamma(\pi^+\pi^-\eta')/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.4	90	55 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$

55 ATHAR 07 reports $< 0.38 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \pi^+ \pi^- \eta') / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$. Γ_{42}/Γ $\Gamma(\bar{K}^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.09 (CL = 90%)	[$<0.10 \times 10^{-3}$ (CL = 90%) OUR 2012 BEST LIMIT]			

<0.09 90 56 ATHAR 07 CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.7	90	57,58 ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma \chi_{c0}$

<0.7 90 58,59 BAI 99B BES $\psi(2S) \rightarrow \gamma \chi_{c0}$ 56 ATHAR 07 reports $< 0.10 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.}) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$.57 ABLIKIM 06R reports $< 0.70 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.}) / \Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$.58 We have multiplied the $K_S^0 K^+ \pi^-$ measurement by a factor of 2 to convert to $K^0 K^+ \pi^-$.59 Rescaled by us using $B(\psi(2S) \rightarrow \gamma \chi_{c0}) = (9.4 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.6 \pm 0.5)\%$. Γ_{43}/Γ

NODE=M056R51

NODE=M056R51

NODE=M056R51;LINKAGE=AT

NODE=M056R17;LINKAGE=AB

NODE=M056R17;LINKAGE=AT

NODE=M056R17;LINKAGE=AB

NODE=M056R17;LINKAGE=BA

NODE=M056R17;LINKAGE=X1

$\Gamma(K^+ K^- \pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.06	90	60 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
60 ATHAR 07 reports $< 0.06 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$.				

 Γ_{44}/Γ NODE=M056R05
NODE=M056R05 $\Gamma(K^+ K^- \eta)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.22 (CL = 90%)	$[<0.23 \times 10^{-3} (\text{CL} = 90\%) \text{ OUR 2012 BEST LIMIT}]$			
<0.22	90	61 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
61 ATHAR 07 reports $< 0.24 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- \eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = 9.84 \times 10^{-2}$.				

 Γ_{45}/Γ NODE=M056R09
NODE=M056R09 $\Gamma(K^+ K^- K_S^0 K_S^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.40±0.47±0.04	16.8 ± 4.8	62 ABLIKIM	050 BES2	$\psi(2S) \rightarrow \gamma \chi_{c0}$
62 ABLIKIM 050 reports $[\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (0.138 \pm 0.039 \pm 0.025) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{46}/Γ NODE=M056R48
NODE=M056R48 $\Gamma(K^+ K^- K^+ K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
2.77±0.29 OUR FIT	$[(2.79 \pm 0.29) \times 10^{-3} \text{ OUR 2012 FIT}]$

 Γ_{47}/Γ NODE=M056R14
NODE=M056R14

NEW

 $\Gamma(K^+ K^- \phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.96±0.25 OUR AVERAGE	$[(0.98 \pm 0.25) \times 10^{-3} \text{ OUR 2012 AVERAGE}]$			
0.96±0.25±0.03	38	63 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma K^+ K^- \phi$
63 ABLIKIM 06T reports $(1.03 \pm 0.22 \pm 0.15) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- \phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{48}/Γ NODE=M056R01
NODE=M056R01

NEW

 $\Gamma(\phi\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
0.79±0.08 OUR FIT	$[(0.82 \pm 0.08) \times 10^{-3} \text{ OUR 2012 FIT}]$

 Γ_{49}/Γ NODE=M056R16
NODE=M056R16

NEW

 $\Gamma(p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>
2.13±0.12 OUR FIT	$[(2.23 \pm 0.13) \times 10^{-4} \text{ OUR 2012 FIT}]$

 Γ_{50}/Γ NODE=M056R11
NODE=M056R11

NEW

 $\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.69±0.07 OUR AVERAGE			Error includes scale factor of 1.2. $[(0.70 \pm 0.07) \times 10^{-3} \text{ OUR 2012 AVERAGE Scale factor} = 1.2]$
0.73±0.06±0.02	64 ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}\pi^0$
0.55±0.12±0.02	65 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
64 ONYISI 10 reports $(7.76 \pm 0.37 \pm 0.51 \pm 0.39) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.			
65 ATHAR 07 reports $(0.59 \pm 0.10 \pm 0.08) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))] = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.			

 Γ_{51}/Γ NODE=M056R06
NODE=M056R06

NEW

NODE=M056R06;LINKAGE=ON

NODE=M056R06;LINKAGE=AT

$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$					Γ_{52}/Γ
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT		
0.35±0.04 OUR AVERAGE					
$[(0.36 \pm 0.04) \times 10^{-3}$ OUR 2012 AVERAGE]					
0.35±0.04±0.01	66 ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$		NODE=M056R50 NODE=M056R50 NEW
0.37±0.11±0.01	67 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$		
66 ONYISI 10 reports $(3.73 \pm 0.38 \pm 0.28 \pm 0.19) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M056R50;LINKAGE=ON	
67 ATHAR 07 reports $(0.39 \pm 0.11 \pm 0.04) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M056R50;LINKAGE=AT	

$\Gamma(p\bar{p}\omega)/\Gamma_{\text{total}}$					Γ_{53}/Γ
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT		
0.52±0.06 OUR AVERAGE					
$[(0.53 \pm 0.06) \times 10^{-3}$ OUR 2012 AVERAGE]					
0.52±0.06±0.02	68 ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$		NODE=M056R70 NODE=M056R70 NEW
68 ONYISI 10 reports $(5.57 \pm 0.48 \pm 0.42 \pm 0.14) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M056R70;LINKAGE=ON	

$\Gamma(p\bar{p}\phi)/\Gamma_{\text{total}}$					Γ_{54}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
6.0±1.4 OUR AVERAGE					
$[(6.1 \pm 1.5) \times 10^{-5}$ OUR 2012 AVERAGE]					
6.0±1.4±0.2	42 ± 8	69 ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+ K^-$	NODE=M056R75 NODE=M056R75 NEW
69 ABLIKIM 11F reports $(6.12 \pm 1.18 \pm 0.86) \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M056R75;LINKAGE=AB	

$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{55}/Γ
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT		
2.1 ± 0.7 OUR EVALUATION			Error includes scale factor of 1.4. Treating systematic error as correlated.		
2.1 ± 1.0 OUR AVERAGE			Error includes scale factor of 2.0.		
1.57±0.21±0.53	70 BAI	99B BES	$\psi(2S) \rightarrow \gamma\chi_{c0}$		NODE=M056R7 NODE=M056R7 → UNCHECKED ←
4.20±1.15±0.18	70 TANENBAUM	78 MRK1	$\psi(2S) \rightarrow \gamma\chi_{c0}$		
70 Rescaled by us using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.4 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$.					NODE=M056R7;LINKAGE=X1

$\Gamma(p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}$					Γ_{56}/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.103±0.028 OUR AVERAGE					
$[(0.105 \pm 0.028)\% \text{ OUR 2012 AVERAGE}]$					
0.103±0.028±0.003	39.5	71 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	NODE=M056R65 NODE=M056R65 NEW
71 HE 08B reports $0.11 \pm 0.02 \pm 0.02 \pm 0.01\%$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M056R65;LINKAGE=HE

$\Gamma(p\bar{p}K^+K^- \text{(non-resonant)})/\Gamma_{\text{total}}$					Γ_{57}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.21±0.26 OUR AVERAGE					
$[(1.23 \pm 0.27) \times 10^{-4} \text{ OUR 2012 AVERAGE}]$					
1.21±0.26±0.04	48 ± 8	72 ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+ K^-$	NODE=M056R72 NODE=M056R72 NEW
72 ABLIKIM 11F reports $(1.24 \pm 0.20 \pm 0.18) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p}K^+ K^- \text{(non-resonant)})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M056R72;LINKAGE=AB

$\Gamma(p\bar{p}K_S^0 K_S^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<8.8	90	73	ABLIKIM	06D BES2 $\psi(2S) \rightarrow \chi_{c0}\gamma$

73 Using $B(\psi(2S) \rightarrow \chi_{c0}\gamma) = (9.2 \pm 0.5)\%$ Γ_{58}/Γ NODE=M056R46
NODE=M056R46 $\Gamma(p\bar{n}\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
11.2±3.1 OUR AVERAGE	$[(11.4 \pm 3.1) \times 10^{-4}$ OUR 2012 AVERAGE]		
11.2±3.0±0.3	74	ABLIKIM	06I BES2 $\psi(2S) \rightarrow \gamma p\pi^- X$

74 ABLIKIM 06I reports $[\Gamma(\chi_{c0}(1P) \rightarrow p\bar{n}\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] = (1.10 \pm 0.24 \pm 0.18) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. $\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	DOCUMENT ID
3.3±0.4 OUR FIT	

 Γ_{60}/Γ NODE=M056R23
NODE=M056R23 $\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<4.0	90	75	ABLIKIM	06D BES2 $\psi(2S) \rightarrow \chi_{c0}\gamma$

75 Using $B(\psi(2S) \rightarrow \chi_{c0}\gamma) = (9.2 \pm 0.5)\%$ Γ_{61}/Γ NODE=M056R44
NODE=M056R44 $\Gamma(K^+\bar{p}\Lambda+c.c.)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.24±0.12 OUR AVERAGE	Error includes scale factor of 1.3.	$[(1.02 \pm 0.19) \times 10^{-3}$ OUR 2012 AVERAGE]		

76 ABLIKIM 13D reports $(1.32 \pm 0.03 \pm 0.10) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+\bar{p}\Lambda+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.68 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
77 Using $B(\Lambda \rightarrow p\pi^-) = 63.9\%$. Γ_{62}/Γ NODE=M056R07
NODE=M056R0778 ATHAR 07 reports $(1.07 \pm 0.17 \pm 0.12) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+\bar{p}\Lambda+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M056R44;LINKAGE=AB

 $\Gamma(K^+p\Lambda(1520)+c.c.)/\Gamma_{\text{total}}$ Γ_{63}/Γ NODE=M056R07;LINKAGE=LB
NODE=M056R07;LINKAGE=AT

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.9±0.7 OUR AVERAGE	$[(3.0 \pm 0.8) \times 10^{-4}$ OUR 2012 AVERAGE]			

79 ABLIKIM 11F reports $(3.00 \pm 0.58 \pm 0.50) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow K^+p\Lambda(1520)+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.NODE=M056R73
NODE=M056R73

NEW

NODE=M056R73;LINKAGE=AB

 $\Gamma(\Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}$ Γ_{64}/Γ NODE=M056R74
NODE=M056R74

NEW

NODE=M056R74;LINKAGE=AB

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
3.1±1.2 OUR AVERAGE	$[(3.2 \pm 1.2) \times 10^{-4}$ OUR 2012 AVERAGE]			

80 ABLIKIM 11F reports $(3.18 \pm 1.11 \pm 0.53) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}$					Γ_{65}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.1±0.7 OUR AVERAGE	$[(4.2 \pm 0.7) \times 10^{-4}$ OUR 2012 AVERAGE]				
4.1±0.7±0.1	78 ± 10	81 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Sigma^0 \bar{\Sigma}^0$	
81 NAIK 08 reports $(4.41 \pm 0.56 \pm 0.47) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(\Sigma^+ \bar{\Sigma}^-)/\Gamma_{\text{total}}$					Γ_{66}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.0±0.7 OUR AVERAGE	$[(3.1 \pm 0.7) \times 10^{-4}$ OUR 2012 AVERAGE]				
3.0±0.7±0.1	39 ± 7	82 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Sigma^+ \bar{\Sigma}^-$	
82 NAIK 08 reports $(3.25 \pm 0.57 \pm 0.43) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \Sigma^+ \bar{\Sigma}^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(\Xi^0 \bar{\Xi}^0)/\Gamma_{\text{total}}$					Γ_{67}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.1±0.8 OUR AVERAGE	$[(3.2 \pm 0.8) \times 10^{-4}$ OUR 2012 AVERAGE]				
3.1±0.8±0.1	23.3 ± 4.9	83 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Xi^0 \bar{\Xi}^0$	
83 NAIK 08 reports $(3.34 \pm 0.70 \pm 0.48) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \Xi^0 \bar{\Xi}^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(\Xi^- \bar{\Xi}^+)/\Gamma_{\text{total}}$					Γ_{68}/Γ
VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
4.8±0.7 OUR AVERAGE	$[(4.9 \pm 0.7) \times 10^{-4}$ OUR 2012 AVERAGE]				
4.8±0.7±0.1	95 ± 11	84 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Xi^- \bar{\Xi}^+$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<10.3	90	85 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \chi_{c0} \gamma$	
84 NAIK 08 reports $(5.14 \pm 0.60 \pm 0.47) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \Xi^- \bar{\Xi}^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.84 \pm 0.31) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
85 Using $B(\psi(2S) \rightarrow \chi_{c0} \gamma) = (9.2 \pm 0.5)\%$					

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\pi\pi)/\Gamma_{\text{total}}$					$\Gamma_{50}/\Gamma \times \Gamma_{31}/\Gamma$
VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT		
18.0±1.2 OUR FIT	$[(19.0 \pm 1.4) \times 10^{-7}$ OUR 2012 FIT]				
15.3±2.4±0.8	86 ANDREOTTI	03 E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow \pi^0 \pi^0$		
86 We have multiplied $B(p\bar{p}) \cdot B(\pi^0 \pi^0)$ measurement by 3 to obtain $B(p\bar{p}) \cdot B(\pi\pi)$.					

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\pi^0 \eta)/\Gamma_{\text{total}}$					$\Gamma_{50}/\Gamma \times \Gamma_{32}/\Gamma$
VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT		
<0.4	ANDREOTTI	05C E835	$\bar{p}p \rightarrow \pi^0 \eta$		

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\pi^0 \eta')/\Gamma_{\text{total}}$					$\Gamma_{50}/\Gamma \times \Gamma_{33}/\Gamma$
VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT		
<2.5	ANDREOTTI	05C E835	$\bar{p}p \rightarrow \pi^0 \eta'$		

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\eta\eta)/\Gamma_{\text{total}}$					$\Gamma_{50}/\Gamma \times \Gamma_{34}/\Gamma$
VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT		
6.4±0.5 OUR FIT	$[(6.8 \pm 0.6) \times 10^{-7}$ OUR 2012 FIT]				
4.0±1.2^{+0.5}_{-0.3}	ANDREOTTI	05C E835	$\bar{p}p \rightarrow \eta\eta$		

NODE=M056R59

NODE=M056R59

NEW

NODE=M056R60

NODE=M056R60

NEW

NODE=M056R61

NODE=M056R61

NEW

NODE=M056R61;LINKAGE=NA

NODE=M056R45

NODE=M056R45

NEW

NODE=M056R45;LINKAGE=NA

NODE=M056R21

NODE=M056R21

NEW

NODE=M056R;LINKAGE=AD

NODE=M056R41

NODE=M056R41

NODE=M056R40

NODE=M056R40

NEW

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\eta\eta)/\Gamma_{\text{total}}$ VALUE (units 10^{-6})

DOCUMENT ID

TECN

COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

 $2.1^{+2.3}_{-1.5}$ ANDREOTTI 05C E835 $\bar{p}p \rightarrow \pi^0\eta$ $\Gamma_{50}/\Gamma \times \Gamma_{35}/\Gamma$

NODE=M056R43

NODE=M056R43

 $\Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

DOCUMENT ID

TECN

COMMENT

 130 ± 7 OUR FIT[(117 ± 8) $\times 10^{-4}$ OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

 $200 \pm 20 \pm 20$

87 ADAM

05A CLEO

 $e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c0}$ 87 Uses $B(\psi(2S) \rightarrow \gamma\chi_{c0} \rightarrow \gamma\gamma J/\psi)$ from ADAM 05A and $B(\psi(2S) \rightarrow \gamma\chi_{c0})$ from ATHAR 04. Γ_{69}/Γ

NODE=M056310

NODE=M056R8

NODE=M056R8

NEW

 $\Gamma(\gamma\rho^0)/\Gamma_{\text{total}}$ VALUE (units 10^{-6})

CL%

EVTS

DOCUMENT ID

TECN

COMMENT

< 9

90

 1.2 ± 4.5

88

BENNETT

08A

CLEO

 $\psi(2S) \rightarrow \gamma\gamma\rho^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 10

90

 6 ± 12

89

ABLIKIM

11E

BES3

 $\psi(2S) \rightarrow \gamma\gamma\rho^0$ 88 BENNETT 08A reports $< 9.6 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$.89 ABLIKIM 11E reports $< 10.5 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. Γ_{70}/Γ

NODE=M056R56

NODE=M056R56

 $\Gamma(\gamma\omega)/\Gamma_{\text{total}}$ VALUE (units 10^{-6})

CL%

EVTS

DOCUMENT ID

TECN

COMMENT

< 8

90

 0.0 ± 2.8

90

BENNETT

08A

CLEO

 $\psi(2S) \rightarrow \gamma\gamma\omega$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 13

90

 5 ± 11

91

ABLIKIM

11E

BES3

 $\psi(2S) \rightarrow \gamma\gamma\omega$ 90 BENNETT 08A reports $< 8.8 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$.91 ABLIKIM 11E reports $< 12.9 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. Γ_{71}/Γ

NODE=M056R57

NODE=M056R57

 $\Gamma(\gamma\phi)/\Gamma_{\text{total}}$ VALUE (units 10^{-6})

CL%

EVTS

DOCUMENT ID

TECN

COMMENT

< 6

90

 0.1 ± 1.6

92

BENNETT

08A

CLEO

 $\psi(2S) \rightarrow \gamma\gamma\phi$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 16

90

 15 ± 7

93

ABLIKIM

11E

BES3

 $\psi(2S) \rightarrow \gamma\gamma\phi$ 92 BENNETT 08A reports $< 6.4 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$.93 ABLIKIM 11E reports $< 16.2 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.62 \pm 0.31) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = 9.84 \times 10^{-2}$. Γ_{72}/Γ

NODE=M056R58

NODE=M056R58

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

CL%

DOCUMENT ID

TECN

COMMENT

 2.25 ± 0.17 OUR FIT[(2.23 ± 0.17) $\times 10^{-4}$ OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 7

90

94 WICHT

08

BELL

 $B^\pm \rightarrow K^\pm\gamma\gamma$ 94 WICHT 08 reports $[\Gamma(\chi_{c0}(1P) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \chi_{c0}(1P)K^+)] < 0.11 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \chi_{c0}(1P)K^+) = 1.49 \times 10^{-4}$. Γ_{73}/Γ

NODE=M056R1

NODE=M056R1

NEW

NODE=M056R1;LINKAGE=WI

$\Gamma(\gamma\gamma)/\Gamma(\gamma J/\psi(1S))$				Γ_{73}/Γ_{69}
VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT	
1.73±0.16 OUR FIT				
$[(1.90 \pm 0.19) \times 10^{-2}$ OUR 2012 FIT]				
2.0 ± 0.4 OUR AVERAGE				
2.2 ± 0.4 $^{+0.1}_{-0.2}$	95 ANDREOTTI 04 E835	$p\bar{p} \rightarrow \chi_{c0} \rightarrow \gamma\gamma$		
1.45 ± 0.74	96 AMBROGIANI 00B E835	$\bar{p}p \rightarrow \chi_{c2} \rightarrow \gamma\gamma, \gamma J/\psi$		
95 The values of $B(p\bar{p})B(\gamma\gamma)$ and $B(\gamma\gamma)B(\gamma J/\psi)$ measured by ANDREOTTI 04 are not independent. The latter is used in the fit because of smaller systematics.				
96 Calculated by us using $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0593 \pm 0.0010$.				

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$			$\Gamma_{50}/\Gamma \times \Gamma_{69}/\Gamma$	
VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
27.8±1.7 OUR FIT				
$[(26.2 \pm 1.7) \times 10^{-7}$ OUR 2012 FIT]				
28.2±2.1 OUR AVERAGE				
28.0 $\pm 1.9 \pm 1.3$	392 97,98,99 BAGNASCO 02 E835	$\bar{p}p \rightarrow \chi_{c0} \rightarrow J/\psi\gamma$		
29.3 $^{+5.7}_{-4.7} \pm 1.5$	89 97,98 AMBROGIANI 99B	$\bar{p}p \rightarrow \chi_{c0} \rightarrow J/\psi\gamma$		
97 Values in $(\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}})$ and $(\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}})$ are not independent. The latter is used in the fit since it is less correlated to the total width.				
98 Calculated by us using $B(J/\psi(1S) \rightarrow e^+e^-) = 0.0593 \pm 0.0010$.				
99 Recalculated by ANDREOTTI 05A.				

$\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$			$\Gamma_{50}/\Gamma \times \Gamma_{73}/\Gamma$
VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
4.8 ± 0.5 OUR FIT			
$[(5.0 \pm 0.5) \times 10^{-8}$ OUR 2012 FIT]			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
6.52 ± 1.18 $^{+0.48}_{-0.72}$	100 ANDREOTTI 04 E835	$p\bar{p} \rightarrow \chi_{c0} \rightarrow \gamma\gamma$	
100 The values of $B(p\bar{p})B(\gamma\gamma)$ and $B(\gamma\gamma)B(\gamma J/\psi)$ measured by ANDREOTTI 04 are not independent. The latter is used in the fit because of smaller systematics.			

$\chi_{c0}(1P)$ CROSS-PARTICLE BRANCHING RATIOS				
$\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$			$\Gamma_{50}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$	
VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
21.0±1.4 OUR FIT				
$[(21.6 \pm 1.4) \times 10^{-6}$ OUR 2012 FIT]				
23.7±1.8 OUR AVERAGE				
23.7 $\pm 1.4 \pm 1.4$	383 ± 22 101 NAIK	08 CLEO $\psi(2S) \rightarrow \gamma p\bar{p}$		
23.6 $^{+3.7}_{-3.4} \pm 3.4$	89.5 $^{+14}_{-13}$ BAI	04F BES $\psi(2S) \rightarrow \gamma\chi_{c0}(1P) \rightarrow \gamma\bar{p}p$		
101 Calculated by us. NAIK 08 reports $B(\chi_c^0 \rightarrow p\bar{p}) = (25.7 \pm 1.5 \pm 1.5 \pm 1.3) \times 10^{-5}$ using $B(\psi(2S) \rightarrow \gamma\chi_c^0) = (9.22 \pm 0.11 \pm 0.46)\%$.				

$\Gamma(\chi_{c0}(1P) \rightarrow p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$			$\Gamma_{50}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$	
VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT	
6.2±0.4 OUR FIT				
$[(6.4 \pm 0.4) \times 10^{-5}$ OUR 2012 FIT]				
4.6±1.9	102 BAI	98I BES $\psi(2S) \rightarrow \gamma\chi_{c0} \rightarrow \gamma\bar{p}p$		

102 Calculated by us. The value for $B(\chi_{c0} \rightarrow p\bar{p})$ reported in BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.3 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$\Gamma(\chi_{c0}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$			$\Gamma_{60}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$	
VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
32 ± 4 OUR FIT				
31.2±3.3±2.0	131 ± 12 103 NAIK	08 CLEO $\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$		
103 Calculated by us. NAIK 08 reports $B(\chi_c^0 \rightarrow \Lambda\bar{\Lambda}) = (33.8 \pm 3.6 \pm 2.2 \pm 1.7) \times 10^{-5}$ using $B(\psi(2S) \rightarrow \gamma\chi_c^0) = (9.22 \pm 0.11 \pm 0.46)\%$.				

NODE=M056R18
NODE=M056R18
NEW

NODE=M056R;LINKAGE=AN
NODE=M056R;LINKAGE=7A

NODE=M056R19
NODE=M056R19
NEW

NODE=M056R;LINKAGE=KS
NODE=M056R19;LINKAGE=7A
NODE=M056R19;LINKAGE=AN

NODE=M056R25
NODE=M056R25
NEW

NODE=M056230

NODE=M056B6
NODE=M056B6
NEW

NODE=M056B6;LINKAGE=NA

NODE=M056B1
NODE=M056B1
NEW

NODE=M056B;LINKAGE=B1

NODE=M056B20
NODE=M056B20

NODE=M056B20;LINKAGE=NA

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{60}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

9.4±1.1 OUR FIT

$[(9.5 \pm 1.1) \times 10^{-5}$ OUR 2012 FIT]

13.0 $^{+3.6}_{-3.5}$ ± 2.5 $15.2^{+4.2}_{-4.0}$ 104 BAI 03E BES $\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$

104 BAI 03E reports [$B(\chi_c^0 \rightarrow \Lambda\bar{\Lambda}) B(\psi(2S) \rightarrow \gamma\chi_c^0) / B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-)$] \times $[B^2(\Lambda \rightarrow \pi^- p) / B(J/\psi \rightarrow p\bar{p})] = (2.45^{+0.68}_{-0.65} \pm 0.46)\%$. We calculate from this measurement the presented value using $B(\Lambda \rightarrow \pi^- p) = (63.9 \pm 0.5)\%$ and $B(J/\psi \rightarrow p\bar{p}) = (2.17 \pm 0.07) \times 10^{-3}$.

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_{69}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

0.128 ± 0.007 OUR FIT

$[(0.113 \pm 0.008) \times 10^{-2}$ OUR 2012 FIT]

0.131 ± 0.035 OUR AVERAGE Error includes scale factor of 3.9. $[(0.073 \pm 0.018) \times 10^{-2}$ OUR 2012 AVERAGE]

0.151 ± 0.003 ± 0.010	4.3k	ABLIKIM	120	BES3	$\psi(2S) \rightarrow \gamma\chi_{c0}$
0.069 ± 0.018	105	OREGLIA	82	CBAL	$\psi(2S) \rightarrow \gamma\chi_{c0}$
0.4 ± 0.3	106	BRANDELIK	79B	DASP	$\psi(2S) \rightarrow \gamma\chi_{c0}$
0.16 ± 0.11	106	BARTEL	78B	CNTR	$\psi(2S) \rightarrow \gamma\chi_{c0}$
3.3 ± 1.7	107	BIDDICK	77	CNTR	$e^+ e^- \rightarrow \gamma X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.125 ± 0.007 ± 0.013	560	108 MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma\chi_{c0}$
0.18 ± 0.01 ± 0.02	172	109 ADAM	05A	CLEO	Repl. by MENDEZ 08

105 Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

106 Recalculated by us using $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = 0.0588 \pm 0.0010$.

107 Assumes isotropic gamma distribution.

108 Not independent from other measurements of MENDEZ 08.

109 Not independent from other values reported by ADAM 05A.

NODE=M056B21

NODE=M056B21

NEW

NODE=M056B21;LINKAGE=BA

NODE=M056B2

NODE=M056B2

NEW

NEW

NODE=M056B;LINKAGE=3Q

NODE=M056B;LINKAGE=2Q

NODE=M056B;LINKAGE=EA

NODE=M056B2;LINKAGE=ME

NODE=M056B2;LINKAGE=AD

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\text{anything})}{\Gamma_{69}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_9^{\psi(2S)}}$$

$$\Gamma_{69}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_9^{\psi(2S)} = \Gamma_{69}/\Gamma \times \Gamma_{118}^{\psi(2S)}/(\Gamma_{11}^{\psi(2S)} + \Gamma_{12}^{\psi(2S)} + \Gamma_{13}^{\psi(2S)} + 0.348\Gamma_{119}^{\psi(2S)} + 0.198\Gamma_{120}^{\psi(2S)})$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

0.213 ± 0.011 OUR FIT

$[(0.191 \pm 0.014) \times 10^{-2}$ OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.201 ± 0.011 ± 0.021	560	110 MENDEZ	08	CLEO	$\psi(2S) \rightarrow \gamma\chi_{c0}$
0.31 ± 0.02 ± 0.03	172	ADAM	05A	CLEO	Repl. by MENDEZ 08

110 Not independent from other measurements of MENDEZ 08.

NODE=M056B7

NODE=M056B7

NODE=M056B7

NEW

NODE=M056B7;LINKAGE=ME

NODE=M056B8

NODE=M056B8

NEW

NODE=M056B;LINKAGE=AD

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_{69}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

0.376 ± 0.020 OUR FIT

$[(0.338 \pm 0.024) \times 10^{-2}$ OUR 2012 FIT]

0.358 ± 0.020 ± 0.037 560 MENDEZ 08 CLEO $\psi(2S) \rightarrow \gamma\chi_{c0}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.55 ± 0.04 ± 0.06	172	111 ADAM	05A	CLEO	Repl. by MENDEZ 08
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111 Not independent from other values reported by ADAM 05A.

NODE=M056B8

NODE=M056B8

NEW

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \gamma\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_{73}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

2.21 ± 0.19 OUR FIT

$[(2.16 \pm 0.19) \times 10^{-5}$ OUR 2012 FIT]

2.21 ± 0.33 OUR AVERAGE

2.17 ± 0.32 ± 0.10	207 ± 31	ECKLUND	08A	CLEO	$\psi(2S) \rightarrow \gamma\chi_{c0} \rightarrow 3\gamma$
3.7 ± 1.8 ± 1.0		LEE	85	CBAL	$\psi(2S) \rightarrow \gamma\chi_{c0}$

NODE=M056B3

NODE=M056B3

NEW

$$\Gamma(\chi_{c0}(1P) \rightarrow \pi\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{31}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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8.32±0.29 OUR FIT[(8.25 ± 0.29) $\times 10^{-4}$ OUR 2012 FIT]**8.80±0.34 OUR AVERAGE**

9.11 $\pm 0.08 \pm 0.65$	17k	112 ABLIKIM	10A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c0}$
8.81 $\pm 0.11 \pm 0.43$	8.9k	113 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$
8.13 $\pm 0.19 \pm 0.89$	2.8k	114 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$

112 Calculated by us. ABLIKIM 10A reports $B(\chi_{c0} \rightarrow \pi^0\pi^0) = (3.23 \pm 0.03 \pm 0.23 \pm 0.14) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.4 \pm 0.4)\%$. We have multiplied the $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.

113 Calculated by us. ASNER 09 reports $B(\chi_{c0} \rightarrow \pi^+\pi^-) = (6.37 \pm 0.08 \pm 0.31 \pm 0.32) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.22 \pm 0.11 \pm 0.46)\%$. We have multiplied the $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.

114 Calculated by us. ASNER 09 reports $B(\chi_{c0} \rightarrow \pi^0\pi^0) = (2.94 \pm 0.07 \pm 0.32 \pm 0.15) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.22 \pm 0.11 \pm 0.46)\%$. We have multiplied the $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.

$$\Gamma(\chi_{c0}(1P) \rightarrow \pi\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$$

$$\Gamma_{31}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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24.4±0.9 OUR FIT[(24.5 ± 0.9) $\times 10^{-4}$ OUR 2012 FIT]**20.7±1.7 OUR AVERAGE**

23.9 $\pm 2.7 \pm 4.1$	97 ± 11	115 BAI	03C BES	$\psi(2S) \rightarrow \gamma\chi_{c0} \rightarrow \gamma\pi^0\pi^0$
20.2 $\pm 1.1 \pm 1.5$	720 ± 32	116 BAI	98I BES	$\psi(2S) \rightarrow \gamma\chi_{c0} \rightarrow \gamma\pi^+\pi^-$

115 We have multiplied $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.

116 Calculated by us. The value for $B(\chi_{c0} \rightarrow \pi^+\pi^-)$ reported in BAI 98I is derived using $B(\psi' \rightarrow \gamma\chi_{c0}) = (9.3 \pm 0.8)\%$ and $B(\psi' \rightarrow J/\psi\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D]. We have multiplied $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.

$$\Gamma(\chi_{c0}(1P) \rightarrow \eta\eta)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{34}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.96±0.18 OUR FIT[(2.93 ± 0.18) $\times 10^{-4}$ OUR 2012 FIT]**3.12±0.19 OUR AVERAGE**

3.23 $\pm 0.09 \pm 0.23$	2132	117 ABLIKIM	10A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c0}$
2.93 $\pm 0.12 \pm 0.29$	0.9k	118 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\eta\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.86 $\pm 0.46 \pm 0.37$	48	119 ADAMS	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c0}$
--------------------------	----	-----------	---------	--

117 Calculated by us. ABLIKIM 10A reports $B(\chi_{c0} \rightarrow \eta\eta) = (3.44 \pm 0.10 \pm 0.24 \pm 0.13) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.4 \pm 0.4)\%$.

118 Calculated by us. ASNER 09 reports $B(\chi_{c0} \rightarrow \eta\eta) = (3.18 \pm 0.13 \pm 0.31 \pm 0.16) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.22 \pm 0.11 \pm 0.46)\%$.

119 Superseded by ASNER 09. Calculated by us. The value of $B(\chi_{c0}(1P) \rightarrow \eta\eta)$ reported by ADAMS 07 was derived using $B(\psi(2S) \rightarrow \gamma\chi_{c0}(1P)) = (9.22 \pm 0.11 \pm 0.46)\%$ (ATHAR 04).

$$\Gamma(\chi_{c0}(1P) \rightarrow \eta\eta)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$$

$$\Gamma_{34}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.87 ± 0.05 OUR FIT**0.578±0.241±0.158**

BAI	03C BES	$\psi(2S) \rightarrow \gamma\eta\eta$
-----	---------	---------------------------------------

$$\Gamma(\chi_{c0}(1P) \rightarrow K^+K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{39}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
--------------------------	------	-------------	------	---------

5.89±0.28 OUR FIT[(5.87 ± 0.28) $\times 10^{-4}$ OUR 2012 FIT]

5.97 $\pm 0.07 \pm 0.32$	8.1k	120 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma K^+K^-$
--------------------------	------	-----------	---------	--------------------------------------

120 Calculated by us. ASNER 09 reports $B(\chi_{c0} \rightarrow K^+K^-) = (6.47 \pm 0.08 \pm 0.35 \pm 0.32) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = (9.22 \pm 0.11 \pm 0.46)\%$.

NODE=M056B22

NODE=M056B22

NEW

OCCUR=2

NODE=M056B22;LINKAGE=AB

NODE=M056B22;LINKAGE=AS

NODE=M056B22;LINKAGE=AN

NODE=M056B5

NODE=M056B5

NEW

NODE=M056B;LINKAGE=D1

NODE=M056B;LINKAGE=D2

NODE=M056B11

NODE=M056B11

NEW

NODE=M056B11;LINKAGE=AB

NODE=M056B11;LINKAGE=AS

NODE=M056B11;LINKAGE=AD

NODE=M056B10

NODE=M056B10

NODE=M056B23

NODE=M056B23

NEW

NODE=M056B23;LINKAGE=AS

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{39}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-3}) EVTS DOCUMENT ID TECN COMMENT

1.73±0.08 OUR FIT

$[(1.75 \pm 0.09) \times 10^{-3}$ OUR 2012 FIT]

1.63±0.10±0.15 774 ± 38 121 BAI 98I BES $\psi(2S) \rightarrow \gamma K^+ K^-$

121 Calculated by us. The value for $B(\chi_{c0} \rightarrow K^+ K^-)$ reported by BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}) = (9.3 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_{40}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) EVTS DOCUMENT ID TECN COMMENT

3.05±0.15 OUR FIT

$[(3.04 \pm 0.15) \times 10^{-4}$ OUR 2012 FIT]

3.18±0.17 OUR AVERAGE

3.22±0.07±0.17 2.1k 122 ASNER 09 CLEO $\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
3.02±0.19±0.33 322 ABLIKIM 050 BES2 $\psi(2S) \rightarrow \gamma K_S^0 K_S^0$

122 Calculated by us. ASNER 09 reports $B(\chi_{c0} \rightarrow K_S^0 K_S^0) = (3.49 \pm 0.08 \pm 0.18 \pm 0.17) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c0}) = (9.22 \pm 0.11 \pm 0.46)\%$.

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{40}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) DOCUMENT ID TECN COMMENT

9.0±0.4 OUR FIT

$[(9.1 \pm 0.5) \times 10^{-4}$ OUR 2012 FIT]

5.6±0.8±1.3 123 BAI 99B BES $\psi(2S) \rightarrow \gamma K_S^0 K_S^0$

123 Calculated by us. The value of $B(\chi_{c0} \rightarrow K_S^0 K_S^0)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.3 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow 2(\pi^+\pi^-))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_1/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-3}) DOCUMENT ID TECN COMMENT

6.5±0.5 OUR FIT

6.9±2.4 OUR AVERAGE Error includes scale factor of 3.8.

4.4±0.1±0.9 124 BAI 99B BES $\psi(2S) \rightarrow \gamma \chi_{c0}$
9.3±0.9 125 TANENBAUM 78 MRK1 $\psi(2S) \rightarrow \gamma \chi_{c0}$

124 Calculated by us. The value for $B(\chi_{c0} \rightarrow 2\pi^+ 2\pi^-)$ reported in BAI 99B is derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}) = (9.3 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

125 The value $B(\psi(1S) \rightarrow \gamma \chi_{c0}) \times B(\chi_{c0} \rightarrow 2\pi^+ 2\pi^-)$ reported in TANENBAUM 78 is derived using $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times B(J/\psi(1S) \rightarrow \ell^+\ell^-) = (4.6 \pm 0.7)\%$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \pi^+\pi^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_8/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-3}) DOCUMENT ID TECN COMMENT

1.74±0.14 OUR FIT

$[(1.73 \pm 0.13) \times 10^{-3}$ OUR 2012 FIT]

1.64±0.05±0.2 ABLIKIM 05Q BES2 $\psi(2S) \rightarrow \gamma \chi_{c0}$

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \pi^+\pi^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_8/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-3}) DOCUMENT ID TECN COMMENT

5.1 ± 0.4 OUR FIT

$[(5.2 \pm 0.4) \times 10^{-3}$ OUR 2012 FIT]

5.8 ± 1.6 OUR AVERAGE Error includes scale factor of 2.3.

4.22±0.20±0.97 BAI 99B BES $\psi(2S) \rightarrow \gamma \chi_{c0}$
7.4 ± 1.0 126 TANENBAUM 78 MRK1 $\psi(2S) \rightarrow \gamma \chi_{c0}$

126 The reported value is derived using $B(\psi(2S) \rightarrow \pi^+\pi^- J/\psi) \times B(J/\psi \rightarrow \ell^+\ell^-) = (4.6 \pm 0.7)\%$. Calculated by us using $B(J/\psi \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

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NODE=M056B18

NODE=M056B18

NEW

NODE=M056B19

NODE=M056B19

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$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_{47}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.72±0.27 OUR FIT[(2.70 ± 0.27) $\times 10^{-4}$ OUR 2012 FIT]**3.20±0.11±0.41** 278 127 ABLIKIM 06T BES2 $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$ 127 Calculated by us. The value of $B(\chi_{c0} \rightarrow 2K^+ 2K^-)$ reported by ABLIKIM 06T was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.2 \pm 0.4)\%$.

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) \Gamma_{47}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
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8.0±0.8 OUR FIT**6.1±0.8±0.9** 128 BAI 99B BES $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$ 128 Calculated by us. The value of $B(\chi_{c0} \rightarrow 2K^+ 2K^-)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.3 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma_{\text{total}}}{\Gamma_{49}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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0.77±0.07 OUR FIT[(0.79 ± 0.08) $\times 10^{-4}$ OUR 2012 FIT]**0.78±0.08 OUR AVERAGE**0.77±0.03±0.08 612 129 ABLIKIM 11K BES3 $\psi(2S) \rightarrow \gamma$ hadrons
0.86±0.19±0.12 26 130 ABLIKIM 06T BES2 $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$ 129 Calculated by us. The value of $B(\chi_{c0} \rightarrow \phi\phi)$ reported by ABLIKIM 11K was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.62 \pm 0.31)\%$.130 Calculated by us. The value of $B(\chi_{c0} \rightarrow \phi\phi)$ reported by ABLIKIM 06T was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.2 \pm 0.4)\%$.

$$\frac{\Gamma(\chi_{c0}(1P) \rightarrow \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c0}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}{\Gamma_{49}/\Gamma \times \Gamma_{118}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
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2.27±0.21 OUR FIT[(2.35 ± 0.23) $\times 10^{-4}$ OUR 2012 FIT]**2.6 ±1.0 ±1.1** 131 BAI 99B BES $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$ 131 Calculated by us. The value of $B(\chi_{c0} \rightarrow \phi\phi)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c0}(1P)) = (9.3 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D]. **$\chi_{c0}(1P)$ REFERENCES**

ABLIKIM	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	120	PRL 109 172002	M. Ablikim <i>et al.</i>	(BES III Collab.)
LIU	12B	PRL 108 232001	Z.Q. Liu <i>et al.</i>	(BELLE Collab.)
ABLIKIM	11A	PR D83 012006	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11E	PR D83 112005	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11F	PR D83 112009	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11K	PRL 107 092001	M. Ablikim <i>et al.</i>	(BES III Collab.)
DEL-AMO-SA...	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
ABLIKIM	10A	PR D81 052005	M. Ablikim <i>et al.</i>	(BES III Collab.)
ONYISI	10	PR D82 011103	P.U.E. Onyisi <i>et al.</i>	(CLEO Collab.)
UEHARA	10A	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)
ASNER	09	PR D79 072007	D.M. Asner <i>et al.</i>	(CLEO Collab.)
UEHARA	09	PR D79 052009	S. Uehara <i>et al.</i>	(BELLE Collab.)
BENNETT	08A	PRL 101 151801	J.V. Bennett <i>et al.</i>	(CLEO Collab.)
ECKLUND	08A	PR D78 091501	K.M. Ecklund <i>et al.</i>	(CLEO Collab.)
HE	08B	PR D78 092004	Q. He <i>et al.</i>	(CLEO Collab.)
MENDEZ	08	PR D78 011102	H. Mendez <i>et al.</i>	(CLEO Collab.)
NAIK	08	PR D78 031101	P. Naik <i>et al.</i>	(CLEO Collab.)
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)
ABE	07	PRL 98 082001	K. Abe <i>et al.</i>	(BELLE Collab.)
ADAMS	07	PR D75 071101	G.S. Adams <i>et al.</i>	(CLEO Collab.)
ATHAR	07	PR D75 032002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
CHEN	07B	PL B651 15	W.T. Chen <i>et al.</i>	(BELLE Collab.)
ABLIKIM	06D	PR D73 052006	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06I	PR D74 012004	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06R	PR D74 072001	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06T	PL B642 197	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05G	PR D71 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05N	PL B630 7	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05O	PL B630 21	M. Ablikim <i>et al.</i>	(BES Collab.)

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ABLIKIM	05Q	PR D72 092002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50958
ADAM	05A	PRL 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)	REFID=50763
ANDREOTTI	05A	NP B717 34	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)	REFID=50769
ANDREOTTI	05C	PR D72 112002	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)	REFID=50991
NAKAZAWA	05	PL B615 39	H. Nakazawa <i>et al.</i>	(BELLE Collab.)	REFID=50807
ABE	04G	PR D70 071102	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=50182
ABLIKIM	04G	PR D70 092002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50187
ABLIKIM	04H	PR D70 092003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50188
ANDREOTTI	04	PL B584 16	M. Andreotti <i>et al.</i>	(E835 Collab.)	REFID=49744
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=50331
BAI	04F	PR D69 092001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49752
ANDREOTTI	03	PRL 91 091801	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)	REFID=49578
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)	REFID=49579
BAI	03C	PR D67 032004	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49190
BAI	03E	PR D67 112001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49416
ABE,K	02	PRL 89 142001	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=49188
BAGNASCIO	02	PL B533 237	S. Bagnasco <i>et al.</i>	(FNAL E835 Collab.)	REFID=48833
EISENSTEIN	01	PRL 87 061801	B.I. Eisenstein <i>et al.</i>	(CLEO Collab.)	REFID=48344
AMBROGIANI	00B	PR D62 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=47940
AMBROGIANI	99B	PRL 83 2902	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=47389
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47385
BAI	98D	PR D58 092006	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46338
BAI	98I	PRL 81 3091	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46343
GAISER	86	PR D34 711	J. Gaisser <i>et al.</i>	(Crystal Ball Collab.)	REFID=22012
LEE	85	SLAC 282	R.A. Lee	(SLAC)	REFID=40589
OREGLIA	82	PR D25 2259	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)	REFID=22120
BRANDELIK	79B	NP B160 426	R. Brandelik <i>et al.</i>	(DASP Collab.)	REFID=22115
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)	REFID=22111
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL)	REFID=22112
Also		Private Comm.	G. Trilling	(LBL, UCB)	REFID=22113
BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)	REFID=22059

 $\chi_{c1}(1P)$ $I^G(J^{PC}) = 0^+(1^{++})$

See the Review on “ $\psi(2S)$ and χ_c branching ratios” before the $\chi_{c0}(1P)$ Listings.

$\chi_{c1}(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3510.66 ± 0.07 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.		
3510.30 ± 0.14 ± 0.16		ABLIKIM 05G	BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$
3510.719 ± 0.051 ± 0.019		ANDREOTTI 05A	E835	$p\bar{p} \rightarrow e^+ e^- \gamma$
3509.4 ± 0.9		BAI 99B	BES	$\psi(2S) \rightarrow \gamma X$
3510.60 ± 0.087 ± 0.019	513	1 ARMSTRONG 92	E760	$\bar{p}p \rightarrow e^+ e^- \gamma$
3511.3 ± 0.4 ± 0.4	30	BAGLIN 86B	SPEC	$\bar{p}p \rightarrow e^+ e^- X$
3512.3 ± 0.3 ± 4.0		2 GAISER 86	CBAL	$\psi(2S) \rightarrow \gamma X$
3507.4 ± 1.7	91	3 LEMOIGNE 82	GOLI	$185 \pi^- Be \rightarrow \gamma \mu^+ \mu^- A$
3510.4 ± 0.6		OREGLIA 82	CBAL	$e^+ e^- \rightarrow J/\psi 2\gamma$
3510.1 ± 1.1	254	4 HIMEL 80	MRK2	$e^+ e^- \rightarrow J/\psi 2\gamma$
3509 ± 11	21	BRANDELIK 79B	DASP	$e^+ e^- \rightarrow J/\psi 2\gamma$
3507 ± 3		4 BARTEL 78B	CNTR	$e^+ e^- \rightarrow J/\psi 2\gamma$
3505.0 ± 4 ± 4		4,5 TANENBAUM 78	MRK1	$e^+ e^-$
3513 ± 7	367	4 BIDDICK 77	CNTR	$\psi(2S) \rightarrow \gamma X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

3500 ± 10 40 TANENBAUM 75 MRK1 Hadrons γ

1 Recalculated by ANDREOTTI 05A, using the value of $\psi(2S)$ mass from AULCHENKO 03.

2 Using mass of $\psi(2S) = 3686.0$ MeV.

3 $J/\psi(1S)$ mass constrained to 3097 MeV.

4 Mass value shifted by us by amount appropriate for $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.

5 From a simultaneous fit to radiative and hadronic decay channels.

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NODE=M055M

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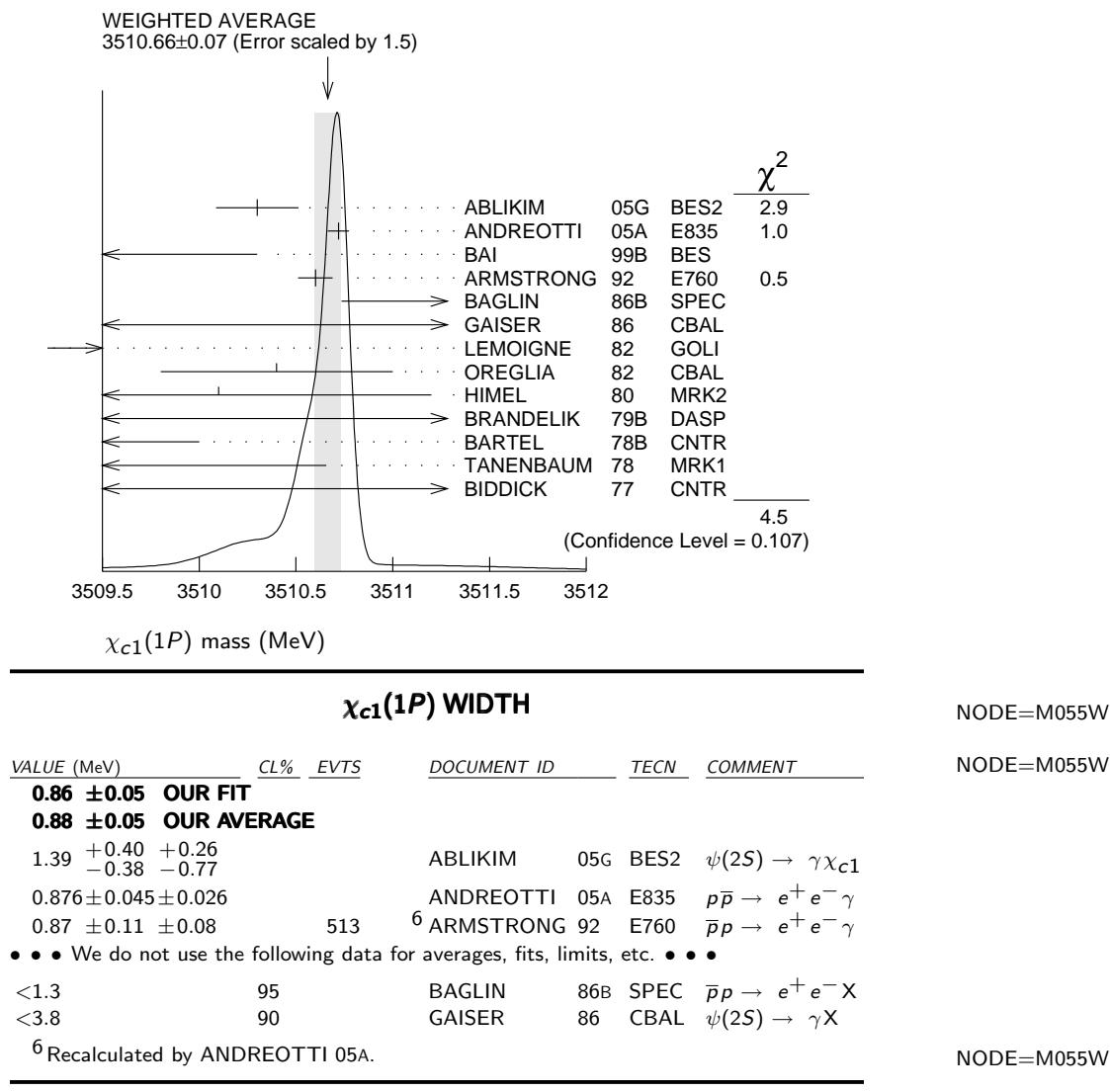
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DESIG=33
DESIG=34

Γ_{19}	$K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.}$	$< 2.3 \times 10^{-3}$	CL=90%	DESIG=35
Γ_{20}	$K^+ K^- \pi^0$	$(1.91 \pm 0.26) \times 10^{-3}$		DESIG=38
Γ_{21}	$\eta \pi^+ \pi^-$	$(5.0 \pm 0.5) \times 10^{-3}$		DESIG=31
Γ_{22}	$a_0(980)^+ \pi^- + \text{c.c.} \rightarrow \eta \pi^+ \pi^-$	$(1.9 \pm 0.7) \times 10^{-3}$		DESIG=36
Γ_{23}	$f_2(1270) \eta$	$(2.8 \pm 0.8) \times 10^{-3}$		DESIG=37
Γ_{24}	$\pi^+ \pi^- \eta'$	$(2.3 \pm 0.5) \times 10^{-3}$		DESIG=44
Γ_{25}	$\pi^0 f_0(980) \rightarrow \pi^0 \pi^+ \pi^-$	$< 6 \times 10^{-6}$	CL=90%	DESIG=61
Γ_{26}	$K^+ K^*(892)^0 \pi^- + \text{c.c.}$	$(3.2 \pm 2.1) \times 10^{-3}$		DESIG=10
Γ_{27}	$K^*(892)^0 \bar{K}^*(892)^0$	$(1.5 \pm 0.4) \times 10^{-3}$		DESIG=21
Γ_{28}	$K^+ K^- K_S^0 K_S^0$	$< 5 \times 10^{-4}$	CL=90%	DESIG=29
Γ_{29}	$K^+ K^- K^+ K^-$	$(5.6 \pm 1.2) \times 10^{-4}$		DESIG=14
Γ_{30}	$K^+ K^- \phi$	$(4.3 \pm 1.6) \times 10^{-4}$		DESIG=30
Γ_{31}	$\omega \omega$	$(6.0 \pm 0.7) \times 10^{-4}$		DESIG=66
Γ_{32}	$\omega \phi$	$(2.2 \pm 0.6) \times 10^{-5}$		DESIG=67
Γ_{33}	$\phi \phi$	$(4.4 \pm 0.6) \times 10^{-4}$		DESIG=68
Γ_{34}	$p \bar{p}$	$(7.3 \pm 0.4) \times 10^{-5}$		DESIG=11
Γ_{35}	$p \bar{p} \pi^0$	$(1.63 \pm 0.20) \times 10^{-4}$		DESIG=39
Γ_{36}	$p \bar{p} \eta$	$(1.53 \pm 0.26) \times 10^{-4}$		DESIG=43
Γ_{37}	$p \bar{p} \omega$	$(2.23 \pm 0.33) \times 10^{-4}$		DESIG=59
Γ_{38}	$p \bar{p} \phi$	$< 1.8 \times 10^{-5}$	CL=90%	DESIG=65
Γ_{39}	$p \bar{p} \pi^+ \pi^-$	$(5.0 \pm 1.9) \times 10^{-4}$		DESIG=8
Γ_{40}	$p \bar{p} \pi^0 \pi^0$			DESIG=54
Γ_{41}	$p \bar{p} K^+ K^- (\text{non-resonant})$	$(1.34 \pm 0.24) \times 10^{-4}$		DESIG=62
Γ_{42}	$p \bar{p} K_S^0 K_S^0$	$< 4.5 \times 10^{-4}$	CL=90%	DESIG=25
Γ_{43}	$\Lambda \bar{\Lambda}$	$(1.18 \pm 0.19) \times 10^{-4}$		DESIG=19
Γ_{44}	$\Lambda \bar{\Lambda} \pi^+ \pi^-$	$< 1.5 \times 10^{-3}$	CL=90%	DESIG=24
Γ_{45}	$K^+ \bar{p} \Lambda$	$(4.3 \pm 0.4) \times 10^{-4}$	S=1.1	DESIG=40
Γ_{46}	$K^+ p \Lambda(1520) + \text{c.c.}$	$(1.8 \pm 0.5) \times 10^{-4}$		DESIG=63
Γ_{47}	$\Lambda(1520) \bar{\Lambda}(1520)$	$< 1.0 \times 10^{-4}$	CL=90%	DESIG=64
Γ_{48}	$\Sigma^0 \bar{\Sigma}^0$	$< 4 \times 10^{-5}$	CL=90%	DESIG=48
Γ_{49}	$\Sigma^+ \bar{\Sigma}^-$	$< 6 \times 10^{-5}$	CL=90%	DESIG=49
Γ_{50}	$\Xi^0 \bar{\Xi}^0$	$< 6 \times 10^{-5}$	CL=90%	DESIG=50
Γ_{51}	$\Xi^- \bar{\Xi}^+$	$(8.4 \pm 2.3) \times 10^{-5}$		DESIG=26
Γ_{52}	$\pi^+ \pi^- + K^+ K^-$	$< 2.1 \times 10^{-3}$		DESIG=23
Γ_{53}	$K_S^0 K_S^0$	$< 6 \times 10^{-5}$	CL=90%	DESIG=27

Radiative decays

Γ_{54}	$\gamma J/\psi(1S)$	$(34.8 \pm 1.5) \%$
Γ_{55}	$\gamma \rho^0$	$(2.27 \pm 0.19) \times 10^{-4}$
Γ_{56}	$\gamma \omega$	$(7.1 \pm 0.9) \times 10^{-5}$
Γ_{57}	$\gamma \phi$	$(2.6 \pm 0.6) \times 10^{-5}$
Γ_{58}	$\gamma \gamma$	

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DESIG=4

CONSTRAINED FIT INFORMATION

A multiparticle fit to $\chi_{c1}(1P)$, $\chi_{c0}(1P)$, $\chi_{c2}(1P)$, and $\psi(2S)$ with 4 total widths, a partial width, 25 combinations of partial widths obtained from integrated cross section, and 84 branching ratios uses 227 measurements to determine 49 parameters. The overall fit has a $\chi^2 = 325.4$ for 178 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$.

x_{29}	8				
x_{34}	-9	-4			
x_{43}	11	5	-5		
x_{54}	38	16	-31	21	
Γ	-13	-5	-60	-7	-29
	x_{15}	x_{29}	x_{34}	x_{43}	x_{54}

$\chi_{c1}(1P)$ PARTIAL WIDTHS **$\chi_{c1}(1P) \Gamma(i)\Gamma(\gamma J/\psi(1S))/\Gamma(\text{total})$**

$\Gamma(p\bar{p}) \times \Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$	$\Gamma_{34}\Gamma_{54}/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT
21.7±0.8 OUR FIT			
21.4±0.9 OUR AVERAGE			
21.5±0.5±0.8	7 ANDREOTTI 05A	E835	$p\bar{p} \rightarrow e^+ e^- \gamma$
21.4±1.5±2.2	7,8 ARMSTRONG 92	E760	$\bar{p}p \rightarrow e^+ e^- \gamma$
19.9 ^{+4.4} _{-4.0}	7 BAGLIN	86B SPEC	$\bar{p}p \rightarrow e^+ e^- X$

7 Calculated by us using $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0593 \pm 0.0010$.

8 Recalculated by ANDREOTTI 05A.

 $\chi_{c1}(1P)$ BRANCHING RATIOS**HADRONIC DECAYS**

$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$	Γ_1/Γ		
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
5.8±1.4 OUR EVALUATION	Error includes scale factor of 1.2. Treating systematic error as correlated.		
5.8±1.1 OUR AVERAGE			
5.4±0.7±0.9	9 BAI	99B BES	$\psi(2S) \rightarrow \gamma \chi_{c1}$
16.0±5.9±0.8	9 TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$

9 Rescaled by us using $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.8 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$.

$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$	Γ_2/Γ		
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
7.6±2.6 OUR EVALUATION	Treating systematic error as correlated.		
8 ±4 OUR AVERAGE	Error includes scale factor of 1.5.		
4.6±2.1±2.6	10 BAI	99B BES	$\psi(2S) \rightarrow \gamma \chi_{c1}$
12.5±4.2±0.6	10 TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$

10 Rescaled by us using $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.8 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$.

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$	Γ_3/Γ			
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
1.25±0.17 OUR AVERAGE	[(1.26 ± 0.17)% OUR 2012 AVERAGE]			
1.25±0.16±0.05	604.7	11 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

11 HE 08B reports $1.28 \pm 0.06 \pm 0.15 \pm 0.08\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\rho^+\pi^-\pi^0+c.c.)/\Gamma_{\text{total}}$	Γ_4/Γ			
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
1.53±0.25±0.06	712.3	12,13 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$

12 HE 08B reports $1.56 \pm 0.13 \pm 0.22 \pm 0.10\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \rho^+\pi^-\pi^0+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.13 Calculated by us. We have added the values from HE 08B for $\rho^+\pi^-\pi^0$ and $\rho^-\pi^+\pi^0$ decays assuming uncorrelated statistical and fully correlated systematic uncertainties.

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_5/Γ		
VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
39±35	14 TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$

14 Estimated using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.

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NODE=M055223

NODE=M055G1

NODE=M055G1

NODE=M055G;LINKAGE=7A
NODE=M055G;LINKAGE=AN

NODE=M055225

NODE=M055305

NODE=M055R6

NODE=M055R6

→ UNCHECKED ←

NODE=M055R;LINKAGE=X2

NODE=M055R4
NODE=M055R4

→ UNCHECKED ←

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NODE=M055R35

NEW

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NODE=M055R36

NODE=M055R36;LINKAGE=HE

NODE=M055R36;LINKAGE=OC

NODE=M055R8
NODE=M055R8

NODE=M055R;LINKAGE=T

$\Gamma(4\pi^0)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
0.57±0.08±0.02	608	15 ABLIKIM	11A BES3	$e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c1}$	
15 ABLIKIM 11A reports $(0.57 \pm 0.03 \pm 0.08) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow 4\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(\pi^+\pi^- K^+ K^-)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.5±1.0 OUR EVALUATION				Treating systematic error as correlated.	
4.5±0.9 OUR AVERAGE					
4.2±0.4±0.9	16 BAI	99B BES		$\psi(2S) \rightarrow \gamma\chi_{c1}$	
7.3±3.0±0.4	16 TANENBAUM	78 MRK1		$\psi(2S) \rightarrow \gamma\chi_{c1}$	
16 Rescaled by us using $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = (8.8 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.6 \pm 0.5)\%$.					
$\Gamma(K^+ K^- \pi^0 \pi^0)/\Gamma_{\text{total}}$					Γ_8/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.117±0.029 OUR AVERAGE				$[(0.118 \pm 0.029)\% \text{ OUR 2012 AVERAGE}]$	
0.117±0.028±0.005	45.1	17 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
17 HE 08B reports $0.12 \pm 0.02 \pm 0.02 \pm 0.01\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \pi^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_9/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.90±0.14 OUR AVERAGE				$[(0.90 \pm 0.15)\% \text{ OUR 2012 AVERAGE}]$	
0.90±0.14±0.03	141.3	18 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
18 HE 08B reports $0.92 \pm 0.09 \pm 0.11 \pm 0.06\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(\rho^+ K^- K^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{10}/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.53±0.13±0.02	141.3	19 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
19 HE 08B reports $0.54 \pm 0.11 \pm 0.07 \pm 0.03\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \rho^+ K^- K^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(K^*(892)^0 K^0 \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{11}/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.24±0.07 OUR AVERAGE				$[(0.25 \pm 0.07)\% \text{ OUR 2012 AVERAGE}]$	
0.24±0.07±0.01	141.3	20 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
20 HE 08B reports $0.25 \pm 0.06 \pm 0.03 \pm 0.02\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^0 K^0 \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.117±0.036±0.005	141.3	21 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
21 HE 08B reports $0.12 \pm 0.03 \pm 0.02 \pm 0.01\%$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

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NODE=M055R44

NODE=M055R44;LINKAGE=AB

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NODE=M055R5
→ UNCHECKED ←

NODE=M055R5;LINKAGE=X2

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NEW

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NODE=M055R39
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NEW

NODE=M055R39;LINKAGE=HE

NODE=M055R40
NODE=M055R40

NODE=M055R40;LINKAGE=HE

NODE=M055R41
NODE=M055R41
NEW

NODE=M055R41;LINKAGE=HE

NODE=M055R42
NODE=M055R42

NODE=M055R42;LINKAGE=HE

$\Gamma(\pi^+ \pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}$	Γ_{13}/Γ	NODE=M055R05 NODE=M055R05
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
7.2±3.0±0.3	19.8 ± 7.7	22 ABLIKIM 050 BES2
22 ABLIKIM 050 reports $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^+ \pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ = $(0.67 \pm 0.26 \pm 0.11) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.	$\psi(2S) \rightarrow \chi_{c1}\gamma$	NODE=M055R05;LINKAGE=AB
$\Gamma(K^+ K^- \eta)/\Gamma_{\text{total}}$	Γ_{14}/Γ	NODE=M055R25 NODE=M055R25
<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
0.33±0.10±0.01	23 ATHAR 07	CLEO
23 ATHAR 07 reports $(0.34 \pm 0.10 \pm 0.04) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $0.0907 \pm 0.0011 \pm 0.0054$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	NODE=M055R25;LINKAGE=AT
$\Gamma(K^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{15}/Γ	NODE=M055R17 NODE=M055R17
<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	
7.3±0.6 OUR FIT		
$\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{16}/Γ	NODE=M055R09 NODE=M055R09
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
1.03±0.38±0.04	22	24 ABLIKIM 06R BES2
24 ABLIKIM 06R reports $(1.1 \pm 0.4 \pm 0.1) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.	$\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R09;LINKAGE=AB
$\Gamma(K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{17}/Γ	NODE=M055R10 NODE=M055R10
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
1.5±0.7±0.1	27	25 ABLIKIM 06R BES2
25 ABLIKIM 06R reports $(1.6 \pm 0.7 \pm 0.2) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.	$\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R10;LINKAGE=AB
$\Gamma(K_J^*(1430)^0 \bar{K}^0 + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{18}/Γ	NODE=M055R12 NODE=M055R12
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>
<0.8	90	26 ABLIKIM 06R BES2
26 ABLIKIM 06R reports $< 0.9 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K_J^*(1430)^0 \bar{K}^0 + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = 9.3×10^{-2} .	$\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R12;LINKAGE=AB
$\Gamma(K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{19}/Γ	NODE=M055R13 NODE=M055R13
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>
<2.3	90	27 ABLIKIM 06R BES2
27 ABLIKIM 06R reports $< 2.4 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K_J^*(1430)^+ K^- + \text{c.c.} \rightarrow K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = 9.3×10^{-2} .	$\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R13;LINKAGE=AB
$\Gamma(K^+ K^- \pi^0)/\Gamma_{\text{total}}$	Γ_{20}/Γ	NODE=M055R20 NODE=M055R20
<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
1.91±0.25±0.07	28 ATHAR 07	CLEO
28 ATHAR 07 reports $(1.95 \pm 0.16 \pm 0.23) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $0.0907 \pm 0.0011 \pm 0.0054$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))$ = $(9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	NODE=M055R20;LINKAGE=AT

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{21}/Γ
5.0±0.5 OUR AVERAGE					NODE=M055R08 NODE=M055R08
4.9±0.5±0.2	29	ATHAR	07	CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$	
5.5±1.0±0.2	222	ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma \chi_{c1}$	
29 ATHAR 07 reports $(5.0 \pm 0.3 \pm 0.5) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054]$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M055R08;LINKAGE=AT	
30 ABLIKIM 06R reports $(5.9 \pm 0.7 \pm 0.8) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}]$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M055R08;LINKAGE=AB	

 $\Gamma(a_0(980)^+\pi^- + \text{c.c.} \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{22}/Γ
1.9±0.7±0.1	58	31 ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R15 NODE=M055R15
31 ABLIKIM 06R reports $(2.0 \pm 0.5 \pm 0.5) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow a_0(980)^+\pi^- + \text{c.c.} \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}]$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M055R15;LINKAGE=AB	

 $\Gamma(f_2(1270)\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{23}/Γ
2.8±0.8±0.1	53	32 ABLIKIM	06R	BES2 $\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R16 NODE=M055R16
32 ABLIKIM 06R reports $(3.0 \pm 0.7 \pm 0.5) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow f_2(1270)\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}]$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M055R16;LINKAGE=AB	

 $\Gamma(\pi^+\pi^-\eta')/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT	Γ_{24}/Γ
2.3±0.5 OUR AVERAGE	$[(2.4 \pm 0.5) \times 10^{-3}$ OUR 2012 AVERAGE]			NODE=M055R28 NODE=M055R28
2.3±0.5±0.1	33 ATHAR	07	CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$	NEW
33 ATHAR 07 reports $(2.4 \pm 0.4 \pm 0.3) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^+\pi^-\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.0907 \pm 0.0011 \pm 0.0054]$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M055R28;LINKAGE=AT

 $\Gamma(\pi^0 f_0(980) \rightarrow \pi^0\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{25}/Γ
<6 × 10⁻⁶	90	34 ABLIKIM	11D	BES3 $\psi(2S) \rightarrow \gamma \pi^0\pi^+\pi^-$	NODE=M055R18 NODE=M055R18
34 ABLIKIM 11D reports $[\Gamma(\chi_{c1}(1P) \rightarrow \pi^0 f_0(980) \rightarrow \pi^0\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] < 6.0 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.				NODE=M055R18;LINKAGE=BR	

 $\Gamma(K^+\bar{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT	Γ_{26}/Γ
32±21	35 TANENBAUM	78	MRK1 $\psi(2S) \rightarrow \gamma \chi_{c1}$	NODE=M055R9 NODE=M055R9
35 Estimated using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.				NODE=M055R9;LINKAGE=T

 $\Gamma(K^*(892)^0\bar{K}^*(892)^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{27}/Γ
1.5±0.4±0.1	28.4 ± 5.5	36,37 ABLIKIM	04H	BES $\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$	NODE=M055R26 NODE=M055R26
36 ABLIKIM 04H reports $[\Gamma(\chi_{c1}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] = (1.40 \pm 0.27 \pm 0.22) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				NODE=M055R26;LINKAGE=AB	
37 Assumes $B(K^*(892)^0 \rightarrow K^- \pi^+) = 2/3$.				NODE=M055R26;LINKAGE=AL	

$\Gamma(K^+ K^- K_S^0 K_S^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<5	90	3.2 ± 2.4	38	ABLIKIM	050 BES2 $\psi(2S) \rightarrow \chi_{c1}\gamma$
38 ABLIKIM 050 reports $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] < 4.2 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.3 \times 10^{-2}$.					

 $\Gamma(K^+ K^- K^+ K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
0.56±0.12 OUR FIT	

 Γ_{28}/Γ NODE=M055R06
NODE=M055R06 $\Gamma(K^+ K^- \phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.43±0.16±0.02	17	39	ABLIKIM	$06T \text{ BES2}$ $\psi(2S) \rightarrow \gamma K^+ K^-$
39 ABLIKIM 06T reports $(0.46 \pm 0.16 \pm 0.06) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- \phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
6.0±0.7±0.2	597	40	ABLIKIM	$11K \text{ BES3}$ $\psi(2S) \rightarrow \gamma \text{ hadrons}$
40 ABLIKIM 11K reports $(6.0 \pm 0.3 \pm 0.7) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{31}/Γ NODE=M055R49
NODE=M055R49 $\Gamma(\omega\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.22±0.06±0.01	15	41	ABLIKIM	$11K \text{ BES3}$ $\psi(2S) \rightarrow \gamma \text{ hadrons}$
41 ABLIKIM 11K reports $(0.22 \pm 0.06 \pm 0.02) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \omega\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{32}/Γ NODE=M055R50
NODE=M055R50 $\Gamma(\phi\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4.4±0.5±0.2	366	42	ABLIKIM	$11K \text{ BES3}$ $\psi(2S) \rightarrow \gamma \text{ hadrons}$
42 ABLIKIM 11K reports $(4.4 \pm 0.3 \pm 0.5) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \phi\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{33}/Γ NODE=M055R51
NODE=M055R51 $\Gamma(p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>
0.73±0.04 OUR FIT	

 Γ_{34}/Γ NODE=M055R11
NODE=M055R11 $\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.163±0.020 OUR AVERAGE			
$[(0.164 \pm 0.020) \times 10^{-3} \text{ OUR 2012 AVERAGE}]$			
0.171±0.020±0.007	43	ONYISI	10 CLE3 $\psi(2S) \rightarrow \gamma p\bar{p}X$
0.117±0.049±0.005	44	ATHAR	07 CLEO $\psi(2S) \rightarrow \gamma h^+ h^- h^0$
43 ONYISI 10 reports $(1.75 \pm 0.16 \pm 0.13 \pm 0.11) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.			
44 ATHAR 07 reports $(1.2 \pm 0.5 \pm 0.1) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) =$			

 Γ_{35}/Γ NODE=M055R21
NODE=M055R21

NEW

NODE=M055R21;LINKAGE=ON

NODE=M055R21;LINKAGE=AT

$(9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$		Γ_{36}/Γ		
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
0.153±0.026±0.006	45	ONYISI	10	$CLE3$ $\psi(2S) \rightarrow \gamma p\bar{p}X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.16	90	46	ATHAR	07	CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$
45 ONYISI 10 reports $(1.56 \pm 0.22 \pm 0.14 \pm 0.10) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.						
46	ATHAR	07	reports $< 0.16 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.			

$\Gamma(p\bar{p}\omega)/\Gamma_{\text{total}}$		Γ_{37}/Γ	
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
0.223±0.033 OUR AVERAGE	$[(0.224 \pm 0.033) \times 10^{-3}$ OUR 2012 AVERAGE]		
0.223±0.032±0.009	47	ONYISI	10

47 ONYISI 10 reports $(2.28 \pm 0.28 \pm 0.16 \pm 0.14) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\phi)/\Gamma_{\text{total}}$		Γ_{38}/Γ		
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<1.8	90	48	ABLIKIM	11F
BES3 $\psi(2S) \rightarrow \gamma p\bar{p}K^+ K^-$				
48	ABLIKIM	11F	reports $< 1.82 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.	

$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$		Γ_{39}/Γ	
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
0.50±0.19 OUR EVALUATION			Treating systematic error as correlated.
0.50±0.19 OUR AVERAGE			
0.46±0.12±0.15	49	BAI	99B
1.08±0.77±0.05	49	TANENBAUM	78
49 Rescaled by us using $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.8 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+\pi^-) = (32.6 \pm 0.5)\%$.			

$\Gamma(p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}$		Γ_{40}/Γ			
VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT	
<0.05	90	50	HE	08B $e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	
Reports < 0.05 % from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.					
50	HE	08B	reports < 0.05 % from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.		

$\Gamma(p\bar{p}K^+K^- (\text{non-resonant}))/\Gamma_{\text{total}}$		Γ_{41}/Γ			
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.34±0.23±0.05	82 ± 9	51	ABLIKIM	11F	
BES3 $\psi(2S) \rightarrow \gamma p\bar{p}K^+ K^-$					
51	ABLIKIM	11F	reports $(1.35 \pm 0.15 \pm 0.19) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p}K^+ K^- (\text{non-resonant}))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.		

$\Gamma(p\bar{p}K_S^0 K_S^0)/\Gamma_{\text{total}}$		Γ_{42}/Γ		
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<4.5	90	52	ABLIKIM	06D
BES2 $\psi(2S) \rightarrow \gamma \chi_{c1}$				
52	Using $B(\psi(2S) \rightarrow \chi_{c1} \gamma)$ (9.1 ± 0.6)%.			

NODE=M055R27
NODE=M055R27

NODE=M055R27;LINKAGE=ON

NODE=M055R43
NODE=M055R43
NEW

NODE=M055R43;LINKAGE=ON

NODE=M055R7
NODE=M055R7
→ UNCHECKED ←

NODE=M055R7;LINKAGE=X2

NODE=M055R38
NODE=M055R38

NODE=M055R38;LINKAGE=HE

NODE=M055R45
NODE=M055R45

NODE=M055R45;LINKAGE=AB

NODE=M055R02
NODE=M055R02

NODE=M055R;LINKAGE=AB

$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$ VALUE (units 10^{-4})**1.18±0.19 OUR FIT**

DOCUMENT ID

 Γ_{43}/Γ

NODE=M055R23

NODE=M055R23

 $\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-3})

CL%

DOCUMENT ID

TECN

COMMENT

<1.5

90

53 ABLIKIM

06D

BES2

 $\psi(2S) \rightarrow \gamma\chi_{c1}$ 53 Using $B(\psi(2S) \rightarrow \chi_{c1}\gamma)$ ($9.1 \pm 0.6\%$). Γ_{44}/Γ

NODE=M055R01

NODE=M055R01

 $\Gamma(K^+\bar{p}\Lambda)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

EVTS

DOCUMENT ID

TECN

COMMENT

4.3±0.4 OUR AVERAGE Error includes scale factor of 1.1. $[(0.32 \pm 0.10) \times 10^{-3}$ OUR 2012 AVERAGE] $4.5 \pm 0.4 \pm 0.2$

3k

54,55 ABLIKIM

13D

BES3

 $\psi(2S) \rightarrow \gamma\Lambda\bar{p}K^+$ $3.2 \pm 0.9 \pm 0.1$

56 ATHAR

07

CLEO

 $\psi(2S) \rightarrow \gamma h^+ h^- h^0$ 54 ABLIKIM 13D reports $(4.5 \pm 0.2 \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+\bar{p}\Lambda)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.55 Using $B(\Lambda \rightarrow p\pi^-) = 63.9\%$.56 ATHAR 07 reports $(3.3 \pm 0.9 \pm 0.4) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+\bar{p}\Lambda)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Γ_{45}/Γ

NODE=M055R22

NODE=M055R22

NEW

 $\Gamma(K^+p\Lambda(1520)+\text{c.c.})/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

EVTS

DOCUMENT ID

TECN

COMMENT

1.8±0.5±0.1

48 ± 10

57 ABLIKIM

11F

BES3

 $\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$ 57 ABLIKIM 11F reports $(1.81 \pm 0.38 \pm 0.28) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow K^+p\Lambda(1520)+\text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Γ_{46}/Γ

NODE=M055R46

NODE=M055R46

 $\Gamma(\Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

CL%

DOCUMENT ID

TECN

COMMENT

<1.0

90

58 ABLIKIM

11F

BES3

 $\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$ 58 ABLIKIM 11F reports $< 1.00 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.3 \times 10^{-2}$. Γ_{47}/Γ

NODE=M055R47

NODE=M055R47

 $\Gamma(\Sigma^0\bar{\Sigma}^0)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

CL%

EVTS

DOCUMENT ID

TECN

COMMENT

<0.4

90

3.8 ± 2.5

59 NAIK

08

CLEO

 $\psi(2S) \rightarrow \gamma\Sigma^0\bar{\Sigma}^0$ 59 NAIK 08 reports $< 0.44 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma^0\bar{\Sigma}^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.3 \times 10^{-2}$. Γ_{48}/Γ

NODE=M055R32

NODE=M055R32

 $\Gamma(\Sigma^+\bar{\Sigma}^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})

CL%

EVTS

DOCUMENT ID

TECN

COMMENT

<0.6

90

4.3 ± 2.3

60 NAIK

08

CLEO

 $\psi(2S) \rightarrow \gamma\Sigma^+\bar{\Sigma}^-$ 60 NAIK 08 reports $< 0.65 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Sigma^+\bar{\Sigma}^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.3 \times 10^{-2}$. Γ_{49}/Γ

NODE=M055R33

NODE=M055R33

NODE=M055R33;LINKAGE=NA

$\Gamma(\Xi^0 \Xi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.6	90	1.7 ± 2.4	61 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Xi^0 \Xi^0$
61 NAIK 08 reports $< 0.60 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Xi^0 \Xi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.					

 Γ_{50}/Γ NODE=M055R34
NODE=M055R34 $\Gamma(\Xi^- \Xi^+)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.84±0.22±0.03	16.4 ± 4.3	62 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma \Xi^+ \Xi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 3.4	90	63 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	
62 NAIK 08 reports $(0.86 \pm 0.22 \pm 0.08) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \Xi^- \Xi^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
63 Using $B(\psi(2S) \rightarrow \chi_{c1} \gamma)$ $(9.1 \pm 0.6)\%$.					

 Γ_{51}/Γ NODE=M055R03
NODE=M055R03 $[\Gamma(\pi^+ \pi^-) + \Gamma(K^+ K^-)]/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<21		64 FELDMAN	77 MRK1	$\psi(2S) \rightarrow \gamma \chi_{c1}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<38	90	64 BRANDELIK	79B DASP	$\psi(2S) \rightarrow \gamma \chi_{c1}$
64 Estimated using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.				

 Γ_{52}/Γ NODE=M055R2
NODE=M055R2 $\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.6	90	65 ABLIKIM	050 BES2	$\psi(2S) \rightarrow \chi_{c1} \gamma$
65 ABLIKIM 050 reports $[\Gamma(\chi_{c1}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))]$ $< 0.6 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = 9.3 \times 10^{-2}$.				

 Γ_{53}/Γ NODE=M055R04
NODE=M055R04

RADIATIVE DECAYS

 $\Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.348±0.015 OUR FIT			
[0.344 ± 0.015 OUR 2012 FIT]			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.379 $\pm 0.008 \pm 0.021$	66 ADAM	05A CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma \chi_{c1}$
66 Uses $B(\psi(2S) \rightarrow \gamma \chi_{c1} \rightarrow \gamma \gamma J/\psi)$ from ADAM 05A and $B(\psi(2S) \rightarrow \gamma \chi_{c1})$ from ATHAR 04.			

 Γ_{54}/Γ NODE=M055R1
NODE=M055R1
NEW $\Gamma(\gamma \rho^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
227±19 OUR AVERAGE				
[(228 ± 19) $\times 10^{-6}$ OUR 2012 AVERAGE]				
226 $\pm 23 \pm 9$				
228 $\pm 25 \pm 9$				
67 ABLIKIM 11E reports $(228 \pm 13 \pm 22) \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma \rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				
68 BENNETT 08A reports $(243 \pm 19 \pm 22) \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma \rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{55}/Γ NODE=M055R29
NODE=M055R29
NEW

NODE=M055R29;LINKAGE=AB

NODE=M055R29;LINKAGE=BE

$\Gamma(\gamma\omega)/\Gamma_{\text{total}}$					Γ_{56}/Γ
<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
71± 9 OUR AVERAGE					
69± 9±3	136 ± 14	69 ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\omega$	
78±18±3	39 ± 7	70 BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\omega$	
69 ABLIKIM 11E reports $(69.7 \pm 7.2 \pm 6.6) \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M055R30 NODE=M055R30
70 BENNETT 08A reports $(83 \pm 15 \pm 12) \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M055R30;LINKAGE=AB
$\Gamma(\gamma\phi)/\Gamma_{\text{total}}$					Γ_{57}/Γ
<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
26±6±1	43 ± 9	71 ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\phi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<24	90	5.2 ± 3.1	72 BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\phi$
71 ABLIKIM 11E reports $(25.8 \pm 5.2 \pm 2.3) \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.2 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (9.3 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M055R31;LINKAGE=AB
72 BENNETT 08A reports $< 26 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c1}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = (8.7 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 9.3 \times 10^{-2}$.					NODE=M055R31;LINKAGE=BE
$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					Γ_{58}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 3.5	90	ECKLUND	08A CLEO	$\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow 3\gamma$	
<150	90	73 YAMADA	77 DASP	$e^+ e^- \rightarrow 3\gamma$	
73 Estimated using $B(\psi(2S) \rightarrow \gamma\chi_{c1}(1P)) = 0.087$. The errors do not contain the uncertainty in the $\psi(2S)$ decay.					NODE=M055R;LINKAGE=T1
$\chi_{c1}(1P)$ CROSS-PARTICLE BRANCHING RATIOS					
$\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$					
<u>VALUE (units 10^{-5})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.98±0.16 OUR FIT					
$[(2.02 \pm 0.16) \times 10^{-5}$ OUR 2012 FIT]					
1.1 ±1.0		74 BAI	98I BES	$\psi(2S) \rightarrow \gamma\chi_{c1} \rightarrow \gamma\bar{p}p$	
74 Calculated by us. The value for $B(\chi_{c1} \rightarrow p\bar{p})$ reported in BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = (8.7 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].					NODE=M055230
$\Gamma(\chi_{c1}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$					
<u>VALUE (units 10^{-6})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
10.9±1.7 OUR FIT					
10.5±1.6±0.6	46 ± 7	75 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$	
75 Calculated by us. NAIK 08 reports $B(\chi_{c1} \rightarrow \Lambda\bar{\Lambda}) = (11.6 \pm 1.8 \pm 0.7 \pm 0.7) \times 10^{-5}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = (9.07 \pm 0.11 \pm 0.54)\%$.					NODE=M055B10;LINKAGE=NA

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)}{\Gamma_{43}/\Gamma \times \Gamma_{119}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

3.2±0.5 OUR FIT

$[(3.3 \pm 0.5) \times 10^{-5}$ OUR 2012 FIT]

7.1^{+2.8}_{-2.4}^{±1.3} $9.0^{+3.5}_{-3.1}$ 76 BAI 03E BES $\psi(2S) \rightarrow \gamma\Lambda\bar{\Lambda}$

76 BAI 03E reports [$B(\chi_{c1} \rightarrow \Lambda\bar{\Lambda}) B(\psi(2S) \rightarrow \gamma\chi_{c1}) / B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-)$] \times $[B^2(\Lambda \rightarrow \pi^- p) / B(J/\psi \rightarrow p\bar{p})] = (1.33^{+0.52}_{-0.46} \pm 0.25)\%$. We calculate from this measurement the presented value using $B(\Lambda \rightarrow \pi^- p) = (63.9 \pm 0.5)\%$ and $B(J/\psi \rightarrow p\bar{p}) = (2.17 \pm 0.07) \times 10^{-3}$.

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma_{\text{total}}}{\Gamma_{54}/\Gamma \times \Gamma_{119}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

3.23 ±0.07 OUR FIT

$[(3.18 \pm 0.08) \times 10^{-2}$ OUR 2012 FIT]

2.93 ±0.15 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.
 $[(2.70 \pm 0.13) \times 10^{-2}$ OUR 2012 AVERAGE]

3.377 ± 0.009 ± 0.183	142k	ABLIKIM	120	BES3	$\psi(2S) \rightarrow \gamma\chi_{c1}$
2.81 ± 0.05 ± 0.23	13k	BAI	04I	BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$
2.56 ± 0.12 ± 0.20		GAISER	86	CBAL	$\psi(2S) \rightarrow \gamma X$
2.78 ± 0.30	77	OREGLIA	82	CBAL	$\psi(2S) \rightarrow \gamma\chi_{c1}$
2.2 ± 0.5	78	BRANDELIK	79B	DASP	$\psi(2S) \rightarrow \gamma\chi_{c1}$
2.9 ± 0.5	78	BARTEL	78B	CNTR	$\psi(2S) \rightarrow \gamma\chi_{c1}$
5.0 ± 1.5	79	BIDDICK	77	CNTR	$e^+e^- \rightarrow \gamma X$
2.8 ± 0.9	77	WHITAKER	76	MRK1	e^+e^-

• • • We do not use the following data for averages, fits, limits, etc. • • •

3.56 ± 0.03 ± 0.12	24.9k	80 MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c1}$
3.44 ± 0.06 ± 0.13	3.7k	81 ADAM	05A CLEO	Repl. by MENDEZ 08

77 Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

78 Recalculated by us using $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = 0.0588 \pm 0.0010$.

79 Assumes isotropic gamma distribution.

80 Not independent from other measurements of MENDEZ 08.

81 Not independent from other values reported by ADAM 05A.

NODE=M055B11

NODE=M055B11

NEW

NODE=M055B11;LINKAGE=BA

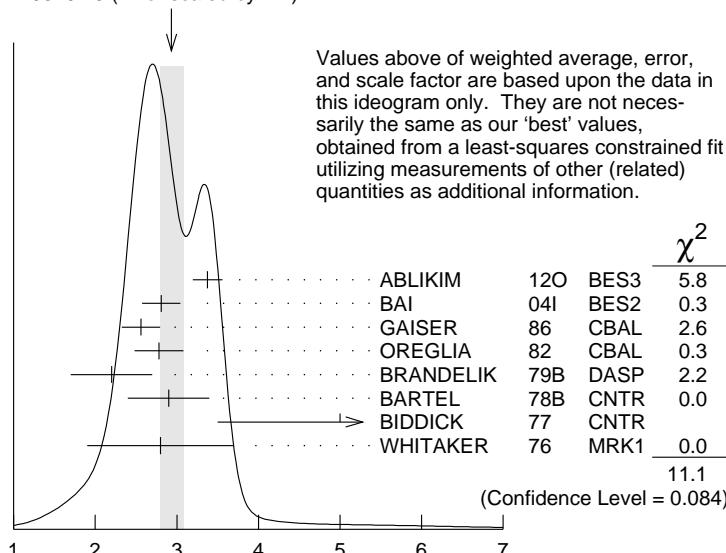
NODE=M055B2

NODE=M055B2

NEW

NEW

WEIGHTED AVERAGE
2.93±0.15 (Error scaled by 1.4)



$$\Gamma(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c1}(1P))/\Gamma_{\text{total}} (\text{units } 10^{-2})$$

$$\Gamma(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \text{anything}) = \frac{\Gamma_{54} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_9^{\psi(2S)}}{\Gamma_{54} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_9^{\psi(2S)} + \Gamma_{12}^{\psi(2S)} / \Gamma_{13}^{\psi(2S)} + 0.348 \Gamma_{119}^{\psi(2S)} + 0.198 \Gamma_{120}^{\psi(2S)}}$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
5.36 ± 0.12 OUR FIT [(5.34 ± 0.12) $\times 10^{-2}$ OUR 2012 FIT]				

• • • We do not use the following data for averages, fits, limits, etc. • • •

5.70 ± 0.04 ± 0.15	24.9k	82 MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma \chi_{c1}$
5.77 ± 0.10 ± 0.12	3.7k	ADAM	05A CLEO	Repl. by MENDEZ 08

82 Not independent from other measurements of MENDEZ 08.

NODE=M055B7

NODE=M055B7

NODE=M055B7

NEW

NODE=M055B7;LINKAGE=ME

$$\Gamma(\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = \frac{\Gamma_{54} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}{\Gamma_{54} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
9.49 ± 0.21 OUR FIT [(9.46 ± 0.23) $\times 10^{-2}$ OUR 2012 FIT]				

10.15 ± 0.28 OUR AVERAGE

10.17 ± 0.07 ± 0.27	24.9k	MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma \chi_{c1}$
12.6 ± 0.3 ± 3.8	3k	83 ABLIKIM	04B BES	$\psi(2S) \rightarrow J/\psi X$
8.5 ± 2.1		84 HIMEL	80 MRK2	$\psi(2S) \rightarrow \gamma \chi_{c1}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

10.24 ± 0.17 ± 0.23	3.7k	85 ADAM	05A CLEO	Repl. by MENDEZ 08
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83 From a fit to the J/ψ recoil mass spectra.

84 The value for $B(\psi(2S) \rightarrow \gamma \chi_{c1}) \times B(\chi_{c1} \rightarrow \gamma J/\psi(1S))$ quoted in HIMEL 80 is derived using $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (33 \pm 3)\%$ and $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.138 \pm 0.018$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

85 Not independent from other values reported by ADAM 05A.

NODE=M055B3

NODE=M055B3

NEW

NODE=M055B;LINKAGE=AB

NODE=M055B;LINKAGE=J3

NODE=M055B3;LINKAGE=AD

$$\Gamma(\chi_{c1}(1P) \rightarrow K^0 K^+ \pi^- + \text{c.c.}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) / \Gamma_{\text{total}} = \frac{\Gamma_{15} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}{\Gamma_{15} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
6.8 ± 0.5 OUR FIT			

7.2 ± 0.6 OUR AVERAGE

7.3 ± 0.5 ± 0.5	86 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^+ \pi^-$	
7.0 ± 0.5 ± 0.9	87 ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma \chi_{c1}$	

86 Calculated by us. The value of $B(\chi_{c1} \rightarrow K^0 K^+ \pi^- + \text{c.c.})$ reported by ATHAR 07 was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (9.07 \pm 0.11 \pm 0.54)\%$.

87 Calculated by us. ABLIKIM 06R reports $B(\chi_{c1} \rightarrow K_S^0 K^+ \pi^-) = (4.0 \pm 0.3 \pm 0.5) \times 10^{-3}$. We use $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (8.7 \pm 0.4) \times 10^{-2}$.

NODE=M055B16

NODE=M055B16

NODE=M055B16;LINKAGE=AT

NODE=M055B16;LINKAGE=AB

NODE=M055B17

NODE=M055B17

NEW

NODE=M055B17;LINKAGE=BA

$$\Gamma(\chi_{c1}(1P) \rightarrow K^0 K^+ \pi^- + \text{c.c.}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) / \Gamma_{\text{total}} = \frac{\Gamma_{15} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}{\Gamma_{15} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT	
19.9 ± 1.6 OUR FIT [(20.1 ± 1.6) $\times 10^{-4}$ OUR 2012 FIT]				

13.2 ± 2.4 ± 3.2	88 BAI	99B BES	$\psi(2S) \rightarrow \gamma K_S^0 K^+ \pi^-$	
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88 Calculated by us. The value of $B(\chi_{c1} \rightarrow K_S^0 K^+ \pi^-)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

NODE=M055B14

NODE=M055B14

$$\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- K^+ K^-) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) / \Gamma_{\text{total}} = \frac{\Gamma_{29} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}{\Gamma_{29} / \Gamma \times \Gamma_{119}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT	
0.52 ± 0.11 OUR FIT				

0.61 ± 0.11 ± 0.08	54	89 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma K^+ K^- K^+ K^-$
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89 Calculated by us. The value of $B(\chi_{c1} \rightarrow 2K^+ 2K^-)$ reported by ABLIKIM 06T was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$.

NODE=M055B14;LINKAGE=AB

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} / \frac{\Gamma_{29}/\Gamma \times \Gamma_{119}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) DOCUMENT ID TECN COMMENT

1.53 ± 0.31 OUR FIT

$[(1.54 \pm 0.31) \times 10^{-4}$ OUR 2012 FIT]

1.13 ± 0.40 ± 0.29 90 BAI 99B BES $\psi(2S) \rightarrow \gamma K^+ K^+ K^- K^-$

90 Calculated by us. The value of $B(\chi_{c1} \rightarrow 2K^+ 2K^-)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c1}(1P)) = (8.7 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c1}(1P) \rightarrow p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c1}(1P))/\Gamma_{\text{total}}}{\Gamma_{34}/\Gamma \times \Gamma_{119}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-6}) EVTS DOCUMENT ID TECN COMMENT

6.7 ± 0.5 OUR FIT

$[(6.8 \pm 0.5) \times 10^{-6}$ OUR 2012 FIT]

7.5 ± 1.4 OUR AVERAGE Error includes scale factor of 2.0.

8.2 ± 0.7 ± 0.4 141 ± 13 91 NAIK 08 CLEO $\psi(2S) \rightarrow \gamma p\bar{p}$
4.8 ± 1.4 ± 0.6 18.2 ± 5.5 BAI 04F BES $\psi(2S) \rightarrow \gamma \chi_{c1}(1P) \rightarrow \gamma \bar{p}p$

91 Calculated by us. NAIK 08 reports $B(\chi_{c1} \rightarrow p\bar{p}) = (9.0 \pm 0.8 \pm 0.4 \pm 0.5) \times 10^{-5}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c1}) = (9.07 \pm 0.11 \pm 0.54)\%$.

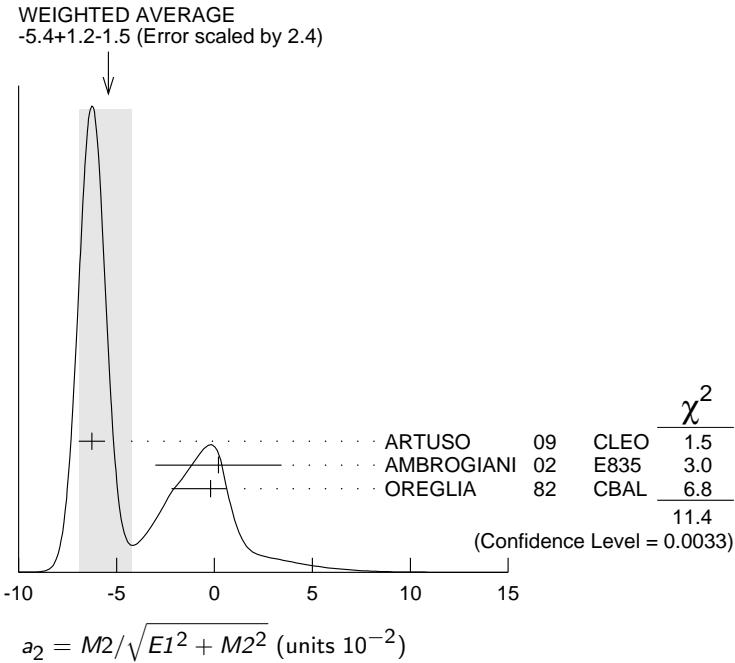
MULTIPOLE AMPLITUDES IN $\chi_{c1}(1P) \rightarrow \gamma J/\psi(1S)$

$$a_2 = M2/\sqrt{E1^2 + M2^2} \text{ Magnetic quadrupole fractional transition amplitude}$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

-5.4 ± 1.2 OUR AVERAGE Error includes scale factor of 2.4. See the ideogram below.

-6.26 ± 0.63 ± 0.24	39k	ARTUSO	09	CLEO	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
0.2 ± 3.2 ± 0.4	2090	AMBROGANI	02	E835	$p\bar{p} \rightarrow \chi_{c1} \rightarrow J/\psi \gamma$
-0.2 ± 0.8 ± 2.0	921	OREGLIA	82	CBAL	$\psi(2S) \rightarrow \chi_{c1} \gamma \rightarrow J/\psi \gamma \gamma$



MULTIPOLE AMPLITUDES IN $\psi(2S) \rightarrow \gamma \chi_{c1}(1S)$ RADIATIVE DECAY

$$b_2 = M2/\sqrt{E1^2 + M2^2} \text{ Magnetic quadrupole fractional transition amplitude}$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

2.9 ± 0.8 OUR AVERAGE

2.76 ± 0.73 ± 0.23	39k	ARTUSO	09	CLEO	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$
7.7 ± 5.0 ± 4.5	921	OREGLIA	82	CBAL	$\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

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NODE=M055QB2

NODE=M055QB2

MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS $\psi(2S) \rightarrow \gamma\chi_{c1}(1S)$ and $\chi_{c1} \rightarrow \gamma J/\psi(1S)$ **a_2/b_2 Magnetic quadrupole transition amplitude ratio**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$-2.27^{+0.57}_{-0.99}$	39k	92 ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

92 Statistical and systematic errors combined. Not independent of $a_2(\chi_{c1})$ and $b_2(\chi_{c1})$ values from ARTUSO 09.

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 $\chi_{c1}(1P)$ REFERENCES

ABLIKIM	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	120	PRL 109 172002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11A	PR D83 012006	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11D	PR D83 032003	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11E	PR D83 112005	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11F	PR D83 112009	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	11K	PRL 107 092001	M. Ablikim <i>et al.</i>	(BES III Collab.)
ONYISI	10	PR D82 011103	P.U.E. Onyisi <i>et al.</i>	(CLEO Collab.)
ARTUSO	09	PR D80 112003	M. Artuso <i>et al.</i>	(CLEO Collab.)
BENNETT	08A	PRL 101 151801	J.V. Bennett <i>et al.</i>	(CLEO Collab.)
ECKLUND	08A	PR D78 091501	K.M. Ecklund <i>et al.</i>	(CLEO Collab.)
HE	08B	PR D78 092004	Q. He <i>et al.</i>	(CLEO Collab.)
MENDEZ	08	PR D78 011102	H. Mendez <i>et al.</i>	(CLEO Collab.)
NAIK	08	PR D78 031101	P. Naik <i>et al.</i>	(CLEO Collab.)
ATHAR	07	PR D75 032002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
ABLIKIM	06D	PR D73 052006	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06R	PR D74 072001	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	06T	PL B642 197	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05G	PR D71 092002	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	05O	PL B630 21	M. Ablikim <i>et al.</i>	(BES Collab.)
ADAM	05A	PR D 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)
ANDREOTTI	05A	NP B717 34	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)
ABLIKIM	04B	PR D70 012003	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	04H	PR D70 092003	M. Ablikim <i>et al.</i>	(BES Collab.)
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)
BAI	04F	PR D69 092001	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	04I	PR D70 012006	J.Z. Bai <i>et al.</i>	(BES Collab.)
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)
BAI	03E	PR D67 112001	J.Z. Bai <i>et al.</i>	(BES Collab.)
AMBROGIANI	02	PR D65 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	98D	PR D58 092006	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	98I	PRL 81 3091	J.Z. Bai <i>et al.</i>	(BES Collab.)
ARMSTRONG	92	NP B373 35	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
Also		PRL 68 1468	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
BAGLIN	86B	PL B172 455	C. Baglin	(LAPP, CERN, GENO, LYON, OSLO+)
GAISER	86	PR D34 711	J. Gaiser <i>et al.</i>	(Crystal Ball Collab.)
LEMOIGNE	82	PL 113B 509	Y. Lemoigne <i>et al.</i>	(SACL, LOIC, SHMP+)
OREGLIA	82	PR D25 2259	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)
Also		Private Comm.	M.J. Oreglia	(EF)
HIMEL	80	PRL 44 920	T. Himel <i>et al.</i>	(LBL, SLAC)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BRANDELIK	79B	NP B160 426	R. Brandelik <i>et al.</i>	(DASP Collab.)
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL)
Also		Private Comm.	G. Trilling	(LBL, UCB)
BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)
YAMADA	77	Hamburg Conf. 69	S. Yamada	(DASP Collab.)
WHITAKER	76	PRL 37 1596	J.S. Whitaker <i>et al.</i>	(SLAC, LBL)
TANENBAUM	75	PRL 35 1323	W.M. Tanenbaum <i>et al.</i>	(LBL, SLAC)

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$h_c(1P)$

$I^G(J^{PC}) = ?^?(1^{+-})$

Quantum numbers are quark model prediction, $C = -$ established by $\eta_c \gamma$ decay.

$h_c(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3525.38±0.11 OUR AVERAGE				
[3525.41 ± 0.16 MeV OUR 2012 AVERAGE Scale factor = 1.2]				
3525.31 ± 0.11 ± 0.14	832	1 ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma$ hadrons
3525.40 ± 0.13 ± 0.18	3679	ABLIKIM	10B BES3	$\psi(2S) \rightarrow \pi^0 \gamma \eta_c$
3525.20 ± 0.18 ± 0.12	1282	2 DOBBS	08A CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$
3525.8 ± 0.2 ± 0.2	13	ANDREOTTI	05B E835	$\bar{p}p \rightarrow \eta_c \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3525.6 ± 0.5	92+23 -22	ADAMS	09 CLEO	$\psi(2S) \rightarrow 2(\pi^+ \pi^- \pi^0)$
3524.4 ± 0.6 ± 0.4	168 ± 40	3 ROSNER	05 CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$
3527 ± 8	42	ANTONIAZZI	94 E705	300 π^\pm , $p\text{Li} \rightarrow J/\psi \pi^0 X$
3526.28 ± 0.18 ± 0.19	59	4 ARMSTRONG	92D E760	$\bar{p}p \rightarrow J/\psi \pi^0$
3525.4 ± 0.8 ± 0.4	5	BAGLIN	86 SPEC	$\bar{p}p \rightarrow J/\psi X$

¹With floating width.

²Combination of exclusive and inclusive analyses for the reaction $\psi(2S) \rightarrow \pi^0 h_c \rightarrow \pi^0 \eta_c \gamma$. This result is the average of DOBBS 08A and ROSNER 05.

³Superseded by DOBBS 08A.

⁴Mass central value and systematic error recalculated by us according to Eq. (16) in ARMSTRONG 93B, using the value for the $\psi(2S)$ mass from AULCHENKO 03.

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NODE=M144M

NEW

$h_c(1P)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.70±0.28±0.22					
832	5	ABLIKIM	12N BES3	$\psi(2S) \rightarrow \pi^0 \gamma$ hadrons	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 1.44	90	3679	6 ABLIKIM	10B BES3	$\psi(2S) \rightarrow \pi^0 \gamma \eta_c$
< 1		13	ANDREOTTI	05B E835	$\bar{p}p \rightarrow \eta_c \gamma$
< 1.1	90	59	ARMSTRONG	92D E760	$\bar{p}p \rightarrow J/\psi \pi^0$

⁵With floating mass.

⁶The central value is $\Gamma = 0.73 \pm 0.45 \pm 0.28$ MeV.

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NODE=M144M;LINKAGE=RO

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NODE=M144W

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NODE=M144W;LINKAGE=AB

NODE=M144215;NODE=M144

$h_c(1P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 J/\psi(1S) \pi^0$	
$\Gamma_2 J/\psi(1S) \pi \pi$	not seen
$\Gamma_3 p\bar{p}$	
$\Gamma_4 \eta_c(1S) \gamma$	(51 ± 6) %
$\Gamma_5 \pi^+ \pi^- \pi^0$	< 2.2 × 10 ⁻³
$\Gamma_6 2\pi^+ 2\pi^- \pi^0$	(2.2 ^{+0.8} _{-0.7}) %
$\Gamma_7 3\pi^+ 3\pi^- \pi^0$	< 2.9 %

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DESIG=2;OUR EST;→ UNCHECKED ←

DESIG=3

DESIG=4

DESIG=5

DESIG=6

DESIG=7

NODE=M144220

NODE=M144223

NODE=M144G1

NODE=M144G1

NODE=M144G1;LINKAGE=AN

$h_c(1P)$ PARTIAL WIDTHS

$h_c(1P) \Gamma(i)\Gamma(\bar{p}p)/\Gamma(\text{total})$

$\Gamma(\eta_c(1S)\gamma) \times \Gamma(p\bar{p})/\Gamma_{\text{total}}$	$\Gamma_4 \Gamma_3/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
12.0 ± 4.5	13 7 ANDREOTTI 05B E835 $\bar{p}p \rightarrow \eta_c \gamma$

⁷Assuming $\Gamma = 1$ MeV.

$h_c(1P)$ BRANCHING RATIOS

$\Gamma(J/\psi(1S)\pi\pi)/\Gamma(J/\psi(1S)\pi^0)$					Γ_2/Γ_1
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.18	90	ARMSTRONG	92D E760	$\bar{p}p \rightarrow J/\psi\pi^0$	

$\Gamma(\eta_c(1S)\gamma)/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
51 ± 6 OUR AVERAGE					

54.3 ± 6.7 ± 5.2	3679	ABLIKIM	10B BES3	$\psi(2S) \rightarrow \pi^0 \gamma \eta_c$	
48 ± 6 ± 7	8 DOBBS	08A CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
48 ± 6 ± 7	1282	9 DOBBS	08A CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$	
46 ± 12 ± 7	168	10 ROSNER	05 CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$	

8 Average of DOBBS 08A and ROSNER 05. DOBBS 08A reports $[\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \pi^0 h_c(1P))] = (4.16 \pm 0.30 \pm 0.37) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \pi^0 h_c(1P)) = (8.6 \pm 1.3) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
9 DOBBS 08A reports $[\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \pi^0 h_c(1P))] = (4.19 \pm 0.32 \pm 0.45) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \pi^0 h_c(1P)) = (8.6 \pm 1.3) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
10 ROSNER 05 reports $[\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \pi^0 h_c(1P))] = (4.0 \pm 0.8 \pm 0.7) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \pi^0 h_c(1P)) = (8.6 \pm 1.3) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT		
<2.2	11 ADAMS	09 CLEO	$\psi(2S) \rightarrow \pi^0 \gamma \eta_c$		

11 ADAMS 09 reports $[\Gamma(h_c(1P) \rightarrow \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \pi^0 h_c(1P))] < 0.19 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \pi^0 h_c(1P)) = 8.6 \times 10^{-4}$.

$\Gamma(2\pi^+ 2\pi^- \pi^0)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.2 ± 0.8 ± 0.3	92	12 ADAMS	09 CLEO	$\psi(2S) \rightarrow \pi^0 \gamma \eta_c$	

12 ADAMS 09 reports $[\Gamma(h_c(1P) \rightarrow 2\pi^+ 2\pi^- \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \pi^0 h_c(1P))] = (1.88 \pm 0.48 \pm 0.47) \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \pi^0 h_c(1P)) = (8.6 \pm 1.3) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3\pi^+ 3\pi^- \pi^0)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT		
<2.9	13 ADAMS	09 CLEO	$\psi(2S) \rightarrow \pi^0 \gamma \eta_c$		

13 ADAMS 09 reports $[\Gamma(h_c(1P) \rightarrow 3\pi^+ 3\pi^- \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \pi^0 h_c(1P))] < 2.5 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \pi^0 h_c(1P)) = 8.6 \times 10^{-4}$.

$\Gamma(h_c(1P) \rightarrow \eta_c(1S)\gamma)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \pi^0 h_c(1P))/\Gamma_{\text{total}}$					$\Gamma_4/\Gamma \times \Gamma_{15}^{\psi(2S)}/\Gamma^{\psi(2S)}$
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.3 ± 0.4 OUR AVERAGE					

4.58 ± 0.40 ± 0.50 3679 14 ABLIKIM 10B BES3 $\psi(2S) \rightarrow \pi^0 \gamma X$
 4.16 ± 0.30 ± 0.37 1430 15 DOBBS 08A CLEO $\psi(2S) \rightarrow \pi^0 \gamma \eta_c$

14 Not independent of other branching fractions in ABLIKIM 10B.
 15 Not independent of other branching fractions in DOBBS 08A.

 $h_c(1P)$ REFERENCES

ABLIKIM	12N	PR D86 092009	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	10B	PR D104 132002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ADAMS	09	PR D80 051106	G.S. Adams <i>et al.</i>	(CLEO Collab.)
DOBBS	08A	PRL 101 182003	S. Dobbs <i>et al.</i>	(CLEO Collab.)
ANDREOTTI	05B	PR D72 032001	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)
ROSNER	05	PRL 95 102003	J.L. Rosner <i>et al.</i>	(CLEO Collab.)
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)
ANTONIAZZI	94	PR D50 4258	L. Antoniazz <i>et al.</i>	(E705 Collab.)
ARMSTRONG	93B	PR D47 772	T.A. Armstrong <i>et al.</i>	(FNAL E760 Collab.)
ARMSTRONG	92D	PRL 69 2337	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)
BAGLIN	86	PL B171 135	C. Baglin <i>et al.</i>	(LAPP, CERN, TORI, STRB+)

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$\chi_{c2}(1P)$ $I^G(J^{PC}) = 0^+(2^{++})$

See the Review on “ $\psi(2S)$ and χ_c branching ratios” before the $\chi_{c0}(1P)$ Listings.

 $\chi_{c2}(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3556.20 ± 0.09 OUR AVERAGE				
3555.3 ± 0.6 ± 2.2	2.5k	UEHARA	08	BELL $\gamma\gamma \rightarrow$ hadrons
3555.70 ± 0.59 ± 0.39		ABLIKIM	05G	BES2 $\psi(2S) \rightarrow \gamma\chi_{c2}$
3556.173 ± 0.123 ± 0.020		ANDREOTTI	05A	E835 $p\bar{p} \rightarrow e^+e^-\gamma$
3559.9 ± 2.9		EISENSTEIN	01	CLE2 $e^+e^- \rightarrow e^+e^-\chi_{c2}$
3556.4 ± 0.7		BAI	99B	BES $\psi(2S) \rightarrow \gamma X$
3556.22 ± 0.131 ± 0.020	585	1 ARMSTRONG	92	E760 $\bar{p}p \rightarrow e^+e^-\gamma$
3556.9 ± 0.4 ± 0.5	50	BAGLIN	86B	SPEC $\bar{p}p \rightarrow e^+e^-X$
3557.8 ± 0.2 ± 4		2 GAISER	86	CBAL $\psi(2S) \rightarrow \gamma X$
3553.4 ± 2.2	66	3 LEMOIGNE	82	GOLI $185\pi^-Be \rightarrow \gamma\mu^+\mu^-A$
3555.9 ± 0.7		4 OREGLIA	82	CBAL $e^+e^- \rightarrow J/\psi 2\gamma$
3557 ± 1.5	69	5 HIMEL	80	MRK2 $e^+e^- \rightarrow J/\psi 2\gamma$
3551 ± 11	15	BRANDELIK	79B	DASP $e^+e^- \rightarrow J/\psi 2\gamma$
3553 ± 4		5 BARTEL	78B	CNTR $e^+e^- \rightarrow J/\psi 2\gamma$
3553 ± 4 ± 4		5,6 TANENBAUM	78	MRK1 e^+e^-
3563 ± 7	360	5 BIDDICK	77	CNTR $e^+e^- \rightarrow \gamma X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

3543 ± 10 4 WHITAKER 76 MRK1 $e^+e^- \rightarrow J/\psi 2\gamma$

1 Recalculated by ANDREOTTI 05A, using the value of $\psi(2S)$ mass from AULCHENKO 03.

2 Using mass of $\psi(2S) = 3686.0$ MeV.

3 $J/\psi(1S)$ mass constrained to 3097 MeV.

4 Assuming $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.

5 Mass value shifted by us by amount appropriate for $\psi(2S)$ mass = 3686 MeV and $J/\psi(1S)$ mass = 3097 MeV.

6 From a simultaneous fit to radiative and hadronic decay channels.

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NODE=M057M

NODE=M057M

 $\chi_{c2}(1P)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.97 ± 0.11 OUR FIT				
[1.98 ± 0.11 MeV OUR 2012 FIT]				
1.95 ± 0.13 OUR AVERAGE				
1.915 ± 0.188 ± 0.013		ANDREOTTI	05A	E835 $p\bar{p} \rightarrow e^+e^-\gamma$
1.96 ± 0.17 ± 0.07	585	7 ARMSTRONG	92	E760 $\bar{p}p \rightarrow e^+e^-\gamma$
2.6 ± 1.4 -1.0	50	BAGLIN	86B	SPEC $\bar{p}p \rightarrow e^+e^-X$
2.8 ± 2.1 -2.0		8 GAISER	86	CBAL $\psi(2S) \rightarrow \gamma X$

NODE=M057M;LINKAGE=NW

NODE=M057M;LINKAGE=C

NODE=M057M;LINKAGE=P

NODE=M057M;LINKAGE=E

NODE=M057M;LINKAGE=D

NODE=M057M;LINKAGE=M

NODE=M057W

NODE=M057W

NEW

 $\chi_{c2}(1P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
Hadronic decays		
Γ_1 $2(\pi^+\pi^-)$	(1.10 ± 0.11) %	
Γ_2 $\rho\rho$		
Γ_3 $\pi^+\pi^-\pi^0\pi^0$	(1.99 ± 0.26) %	
Γ_4 $\rho^+\pi^-\pi^0 + c.c.$	(2.4 ± 0.4) %	
Γ_5 $4\pi^0$	(1.21 ± 0.17) × 10 ⁻³	
Γ_6 $K^+K^-\pi^0\pi^0$	(2.2 ± 0.4) × 10 ⁻³	
Γ_7 $K^+\pi^-K^0\pi^0 + c.c.$	(1.50 ± 0.22) %	
Γ_8 $\rho^+K^-K^0 + c.c.$	(4.5 ± 1.4) × 10 ⁻³	

NODE=M057;CLUMP=A

DESIG=3

DESIG=43

DESIG=50

DESIG=51

DESIG=62

DESIG=52

DESIG=54

DESIG=55

NODE=M057W;LINKAGE=AN

NODE=M057W;LINKAGE=E

NODE=M057215;NODE=M057

Γ_9	$K^*(892)^0 K^+ \pi^- \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.}$	$(3.2 \pm 0.9) \times 10^{-3}$	DESIG=60
Γ_{10}	$K^*(892)^0 K^0 \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.}$	$(4.2 \pm 0.9) \times 10^{-3}$	DESIG=56
Γ_{11}	$K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.}$	$(4.0 \pm 0.9) \times 10^{-3}$	DESIG=57
Γ_{12}	$K^*(892)^+ K^0 \pi^- \rightarrow K^+ \pi^- K^0 \pi^0 + \text{c.c.}$	$(3.2 \pm 0.9) \times 10^{-3}$	DESIG=58
Γ_{13}	$K^+ K^- \eta \pi^0$	$(1.4 \pm 0.5) \times 10^{-3}$	DESIG=59
Γ_{14}	$K^+ K^- \pi^+ \pi^-$	$(9.1 \pm 1.1) \times 10^{-3}$	DESIG=5
Γ_{15}	$K^+ K^- \pi^+ \pi^- \pi^0$	$(1.3 \pm 0.4) \%$	DESIG=67
Γ_{16}	$K^+ \bar{K}^*(892)^0 \pi^- + \text{c.c.}$	$(2.3 \pm 1.2) \times 10^{-3}$	DESIG=10
Γ_{17}	$K^*(892)^0 \bar{K}^*(892)^0$	$(2.5 \pm 0.5) \times 10^{-3}$	DESIG=21
Γ_{18}	$3(\pi^+ \pi^-)$	$(8.6 \pm 1.8) \times 10^{-3}$	DESIG=4
Γ_{19}	$\phi \phi$	$(1.16 \pm 0.10) \times 10^{-3}$	DESIG=16
Γ_{20}	$\omega \omega$	$(9.2 \pm 1.1) \times 10^{-4}$	DESIG=25
Γ_{21}	$\omega \phi$		DESIG=68
Γ_{22}	$\pi \pi$	$(2.42 \pm 0.13) \times 10^{-3}$	DESIG=22
Γ_{23}	$\rho^0 \pi^+ \pi^-$	$(4.0 \pm 1.7) \times 10^{-3}$	DESIG=9
Γ_{24}	$\pi^+ \pi^- \eta$	$(5.2 \pm 1.4) \times 10^{-4}$	DESIG=39
Γ_{25}	$\pi^+ \pi^- \eta'$	$(5.4 \pm 2.0) \times 10^{-4}$	DESIG=42
Γ_{26}	$\eta \eta$	$(5.9 \pm 0.5) \times 10^{-4}$	DESIG=14
Γ_{27}	$K^+ K^-$	$(1.09 \pm 0.08) \times 10^{-3}$	DESIG=2
Γ_{28}	$K_S^0 K_S^0$	$(5.8 \pm 0.5) \times 10^{-4}$	DESIG=15
Γ_{29}	$\bar{K}^0 K^+ \pi^- + \text{c.c.}$	$(1.39 \pm 0.20) \times 10^{-3}$	DESIG=17
Γ_{30}	$K^+ K^- \pi^0$	$(3.3 \pm 0.8) \times 10^{-4}$	DESIG=36
Γ_{31}	$K^+ K^- \eta$	$< 3.5 \times 10^{-4}$	90% DESIG=40
Γ_{32}	$\eta \eta'$	$< 6 \times 10^{-5}$	90% DESIG=34
Γ_{33}	$\eta' \eta'$	$< 1.1 \times 10^{-4}$	90% DESIG=35
Γ_{34}	$\pi^+ \pi^- K_S^0 K_S^0$	$(2.4 \pm 0.6) \times 10^{-3}$	DESIG=29
Γ_{35}	$K^+ K^- \bar{K}_S^0 \bar{K}_S^0$	$< 4 \times 10^{-4}$	90% DESIG=30
Γ_{36}	$K^+ K^- K^+ K^-$	$(1.78 \pm 0.22) \times 10^{-3}$	DESIG=24
Γ_{37}	$K^+ K^- \phi$	$(1.54 \pm 0.32) \times 10^{-3}$	DESIG=32
Γ_{38}	$p \bar{p}$	$(7.1 \pm 0.4) \times 10^{-5}$	DESIG=11
Γ_{39}	$p \bar{p} \pi^0$	$(5.1 \pm 0.5) \times 10^{-4}$	DESIG=37
Γ_{40}	$p \bar{p} \eta$	$(1.89 \pm 0.28) \times 10^{-4}$	DESIG=41
Γ_{41}	$p \bar{p} \omega$	$(3.9 \pm 0.5) \times 10^{-4}$	DESIG=61
Γ_{42}	$p \bar{p} \phi$	$(3.0 \pm 1.0) \times 10^{-5}$	DESIG=66
Γ_{43}	$p \bar{p} \pi^+ \pi^-$	$(1.32 \pm 0.34) \times 10^{-3}$	DESIG=8
Γ_{44}	$p \bar{p} \pi^0 \pi^0$	$(8.5 \pm 2.6) \times 10^{-4}$	DESIG=53
Γ_{45}	$p \bar{p} K^+ K^- (\text{non-resonant})$	$(2.08 \pm 0.35) \times 10^{-4}$	DESIG=63
Γ_{46}	$p \bar{p} K_S^0 K_S^0$	$< 7.9 \times 10^{-4}$	90% DESIG=28
Γ_{47}	$p \bar{n} \pi^-$	$(1.1 \pm 0.4) \times 10^{-3}$	DESIG=31
Γ_{48}	$\Lambda \bar{\Lambda}$	$(1.86 \pm 0.27) \times 10^{-4}$	DESIG=19
Γ_{49}	$\Lambda \bar{\Lambda} \pi^+ \pi^-$	$< 3.5 \times 10^{-3}$	90% DESIG=27
Γ_{50}	$K^+ \bar{p} \Lambda + \text{c.c.}$	$(8.4 \pm 0.6) \times 10^{-4}$	DESIG=38
Γ_{51}	$K^+ p \Lambda(1520) + \text{c.c.}$	$(3.1 \pm 0.7) \times 10^{-4}$	DESIG=64
Γ_{52}	$\Lambda(1520) \bar{\Lambda}(1520)$	$(5.0 \pm 1.6) \times 10^{-4}$	DESIG=65
Γ_{53}	$\Sigma^0 \bar{\Sigma}^0$	$< 8 \times 10^{-5}$	90% DESIG=47
Γ_{54}	$\Sigma^+ \bar{\Sigma}^-$	$< 7 \times 10^{-5}$	90% DESIG=48
Γ_{55}	$\Xi^0 \bar{\Xi}^0$	$< 1.1 \times 10^{-4}$	90% DESIG=49
Γ_{56}	$\Xi^- \bar{\Xi}^+$	$(1.55 \pm 0.35) \times 10^{-4}$	DESIG=26
Γ_{57}	$J/\psi(1S) \pi^+ \pi^- \pi^0$	$< 1.5 \% \quad 90\%$	DESIG=12
Γ_{58}	$\eta_c(1S) \pi^+ \pi^-$	$< 2.3 \% \quad 90\%$	DESIG=69

Radiative decays

Γ_{59}	$\gamma J/\psi(1S)$	$(19.8 \pm 0.8) \%$	NODE=M057;CLUMP=B
Γ_{60}	$\gamma \rho^0$	$< 2.1 \times 10^{-5}$	90% DESIG=6
Γ_{61}	$\gamma \omega$	$< 6 \times 10^{-6}$	90% DESIG=44
Γ_{62}	$\gamma \phi$	$< 8 \times 10^{-6}$	90% DESIG=45
Γ_{63}	$\gamma \gamma$	$(2.61 \pm 0.16) \times 10^{-4}$	DESIG=46

$242 \pm 65 \pm 51$	$11,14$	ACKER..,K...	98	OPAL	$e^+ e^- \rightarrow e^+ e^- \chi_{c2}$
$150 \pm 42 \pm 36$	$11,15$	DOMINICK	94	CLE2	$e^+ e^- \rightarrow e^+ e^- \chi_{c2}$
$470 \pm 240 \pm 120$	$11,16$	BAUER	93	TPC	$e^+ e^- \rightarrow e^+ e^- \chi_{c2}$
11 Calculated by us using $B(J/\psi \rightarrow \ell^+ \ell^-) = 0.1187 \pm 0.0008$.					
12 All systematic errors added in quadrature.					
13 The value for $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$ reported in ACCIARRI 99E is derived using $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) \times B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.0162 \pm 0.0014$.					
14 The value for $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$ reported in ACKERSTAFF,K 98 is derived using $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) = 0.135 \pm 0.011$ and $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1203 \pm 0.0038$.					
15 The value for $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$ reported in DOMINICK 94 is derived using $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) = 0.135 \pm 0.011$, $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0627 \pm 0.0020$, and $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0597 \pm 0.0025$.					
16 The value for $\Gamma(\chi_{c2} \rightarrow \gamma\gamma)$ reported in BAUER 93 is derived using $B(\chi_{c2} \rightarrow \gamma J/\psi(1S)) = 0.135 \pm 0.011$, $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0627 \pm 0.0020$, and $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0597 \pm 0.0025$.					

 $\chi_{c2}(1P) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_1\Gamma_{63}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
5.7 ± 0.5 OUR FIT					
[5.6 ± 0.5 eV OUR 2012 FIT]					
5.2 ± 0.7 OUR AVERAGE					
$5.01 \pm 0.44 \pm 0.55$	1597 ± 138	UEHARA 08	BELL	$\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(\pi^+\pi^-)$	
$6.4 \pm 1.8 \pm 0.8$		EISENSTEIN 01	CLE2	$e^+ e^- \rightarrow e^+ e^- \chi_{c2}$	

$\Gamma(\rho\rho) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_2\Gamma_{63}/\Gamma$			
VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<7.8	90	<598	UEHARA 08	BELL	$\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(\pi^+\pi^-)$

$\Gamma(K^+ K^- \pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{14}\Gamma_{63}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
4.7 ± 0.5 OUR FIT					
4.42 $\pm 0.42 \pm 0.53$					

$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{15}\Gamma_{63}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
6.5 $\pm 0.9 \pm 1.5$	1250	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	

$\Gamma(K^*(892)^0 \bar{K}^*(892)^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{17}\Gamma_{63}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
1.26 ± 0.24 OUR FIT					
0.8 $\pm 0.17 \pm 0.27$					

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{19}\Gamma_{63}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.59 ± 0.05 OUR FIT					
[0.58 ± 0.06 eV OUR 2012 FIT]					

$\Gamma(\phi\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{19}\Gamma_{63}/\Gamma$			
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.62 ± 0.09 OUR AVERAGE					
[0.58 ± 0.24 eV OUR 2012 AVERAGE]					
0.62 $\pm 0.07 \pm 0.05$					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
89 ± 11	¹⁷ LIU	12B	BELL	$\gamma\gamma \rightarrow 2(K^+ K^-)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.58 \pm 0.18 \pm 0.16$ 26.5 \pm 8.1 UEHARA 08 BELL $\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(K^+ K^-)$

17 Supersedes UEHARA 08. Using $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$.

$\Gamma(\omega\omega) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{20}\Gamma_{63}/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.64	90	18 LIU	12B	$\gamma\gamma \rightarrow 2(\pi^+ \pi^- \pi^0)$	

18 Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7)\%$.

$\Gamma(\omega\phi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		$\Gamma_{21}\Gamma_{63}/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.04	90	19 LIU	12B	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	

19 Using $B(\phi \rightarrow K^+ K^-) = (48.9 \pm 0.5)\%$ and $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = (89.2 \pm 0.7)\%$.

NODE=M057G;LINKAGE=LL

NODE=M057G;LINKAGE=GT

NODE=M057G;LINKAGE=J4

NODE=M057G;LINKAGE=J5

NODE=M057G;LINKAGE=J6

NODE=M057G;LINKAGE=J7

NODE=M057224

NODE=M057G3

NODE=M057G3

NEW

NODE=M057G09

NODE=M057G09

NODE=M057G02

NODE=M057G02

NODE=M057G10

NODE=M057G10

NEW

NEW

NODE=M057G12;LINKAGE=LI

NODE=M057G03

NODE=M057G03

NODE=M057G04

NODE=M057G04

NODE=M057G04;LINKAGE=LI

$\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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1.24±0.08 OUR FIT**1.18±0.25 OUR AVERAGE**1.44±0.54±0.47 34 ± 13 20 UEHARA 09 BELL 10.6 $e^+ e^- \rightarrow e^+ e^- \pi^0 \pi^0$ 1.14±0.21±0.17 54 ± 10 21 NAKAZAWA 05 BELL 10.6 $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^-$ 20 We multiplied the measurement by 3 to convert from $\pi^0 \pi^0$ to $\pi\pi$. Interference with the continuum included.21 We have multiplied $\pi^+ \pi^-$ measurement by 3/2 to obtain $\pi\pi$. $\Gamma_{22}\Gamma_{63}/\Gamma$

NODE=M057G4

NODE=M057G4

 $\Gamma(\rho^0 \pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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2.0±0.9 OUR FIT**3.2±1.9±0.5** 986 ± 578 UEHARA 08 BELL $\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(\pi^+ \pi^-)$ $\Gamma_{23}\Gamma_{63}/\Gamma$
 $\Gamma(\eta\eta) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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0.53±0.22±0.09 8 22 UEHARA 10A BELL 10.6 $e^+ e^- \rightarrow e^+ e^- \eta\eta$

22 Interference with the continuum not included.

 $\Gamma_{26}\Gamma_{63}/\Gamma$

NODE=M057G13

NODE=M057G13

 $\Gamma(K^+ K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
------------	------	-------------	------	---------

0.56±0.04 OUR FIT

[0.56 ± 0.05 eV OUR 2012 FIT]

0.44±0.11±0.07 33 ± 8 NAKAZAWA 05 BELL 10.6 $e^+ e^- \rightarrow e^+ e^- K^+ K^-$ $\Gamma_{27}\Gamma_{63}/\Gamma$
 $\Gamma(K_S^0 K_S^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
------------	------	-------------	------	---------

0.297±0.025 OUR FIT

[0.297 ± 0.026 eV OUR 2012 FIT]

0.31 ± 0.05 ± 0.03 38 ± 7 CHEN 07B BELL $e^+ e^- \rightarrow e^+ e^- \chi_{c2}$ $\Gamma_{28}\Gamma_{63}/\Gamma$

NODE=M057G6

NODE=M057G6

NEW

 $\Gamma(\bar{K}^0 K^+ \pi^- + \text{c.c.}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
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0.71±0.11 OUR FIT

[0.72 ± 0.11 eV OUR 2012 FIT]

1.20±0.33±0.13 126 23 DEL-AMO-SA..11M BABR $\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$ 23 We have multiplied $\bar{K}K\pi$ by 2/3 to obtain $\bar{K}^0 K^+ \pi^- + \text{c.c.}$ $\Gamma_{29}\Gamma_{63}/\Gamma$

NODE=M057G01

NODE=M057G01

NEW

 $\Gamma(K^+ K^- K^+ K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
------------	------	-------------	------	---------

0.91±0.12 OUR FIT**1.10±0.21±0.15** 126 ± 24 UEHARA 08 BELL $\gamma\gamma \rightarrow \chi_{c2} \rightarrow 2(K^+ K^-)$ $\Gamma_{36}\Gamma_{63}/\Gamma$

NODE=M057G11

NODE=M057G11

 $\Gamma(\eta_c(1S)\pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
------------	-----	-------------	------	---------

<15.7 90 LEES 12AE BABR $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$ $\Gamma_{58}\Gamma_{63}/\Gamma$

NODE=M057G05

NODE=M057G05

 $\chi_{c2}(1P)$ BRANCHING RATIOS

— HADRONIC DECAYS —

 $\Gamma(2(\pi^+ \pi^-))/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID
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0.0110±0.0011 OUR FIT Γ_1/Γ

NODE=M057225

NODE=M057305

 $\Gamma(\rho^0 \pi^+ \pi^-)/\Gamma(2(\pi^+ \pi^-))$

VALUE	DOCUMENT ID	TECN	COMMENT
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0.36±0.15 OUR FIT**0.31±0.17** Γ_{23}/Γ_1

NODE=M057R38

NODE=M057R38

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
1.99±0.26 OUR AVERAGE	[(2.00 ± 0.26)% OUR 2012 AVERAGE]				
1.99±0.25±0.08	903.5	24 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$	
24 HE 08B reports $1.87 \pm 0.07 \pm 0.22 \pm 0.13$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M057R46

NODE=M057R46

NEW

NODE=M057R46;LINKAGE=HE

$\Gamma(\rho^+\pi^-\pi^0+c.c.)/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
2.4±0.4±0.1	1031.9	25,26 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$	
25 HE 08B reports $2.23 \pm 0.11 \pm 0.32 \pm 0.16$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \rho^+\pi^-\pi^0+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
26 Calculated by us. We have added the values from HE 08B for $\rho^+\pi^-\pi^0$ and $\rho^-\pi^+\pi^0$ decays assuming uncorrelated statistical and fully correlated systematic uncertainties.					

NODE=M057R47

NODE=M057R47

NODE=M057R47;LINKAGE=HE

NODE=M057R47;LINKAGE=OC

$\Gamma(4\pi^0)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.21±0.16±0.05	1164	27 ABLIKIM	11A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c2}$	
27 ABLIKIM 11A reports $(1.21 \pm 0.05 \pm 0.16) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow 4\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M057R58

NODE=M057R58

NODE=M057R58;LINKAGE=AB

$\Gamma(K^+K^-\pi^0\pi^0)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.22±0.04 OUR AVERAGE	[(0.22 ± 0.05)% OUR 2012 AVERAGE]				
0.22±0.04±0.01	76.9	28 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$	
28 HE 08B reports $0.21 \pm 0.03 \pm 0.03 \pm 0.01$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M057R48

NODE=M057R48

NEW

NODE=M057R48;LINKAGE=HE

$\Gamma(K^+\pi^-K^0\pi^0+c.c.)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
1.50±0.22 OUR AVERAGE	[(1.51 ± 0.22)% OUR 2012 AVERAGE]				
1.50±0.21±0.06	211.6	29 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$	
29 HE 08B reports $1.41 \pm 0.11 \pm 0.16 \pm 0.10$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+\pi^-K^0\pi^0+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M057R50

NODE=M057R50

NEW

NODE=M057R50;LINKAGE=HE

$\Gamma(\rho^+K^-K^0\pi^0+c.c.)/\Gamma_{\text{total}}$					Γ_8/Γ
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
0.45±0.13±0.02	62.9	30 HE	08B CLEO	$e^+e^- \rightarrow \gamma h^+h^-h^0h^0$	
30 HE 08B reports $0.42 \pm 0.11 \pm 0.06 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \rho^+K^-K^0\pi^0+c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M057R51

NODE=M057R51

NODE=M057R51;LINKAGE=HE

$\Gamma(K^*(892)^0 K^+ \pi^- \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_9/Γ
0.32±0.09±0.01	38.7	31 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	

31 HE 08B reports $0.30 \pm 0.07 \pm 0.04 \pm 0.02$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0 K^+ \pi^- \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^*(892)^0 K^0 \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{10}/Γ
0.42±0.09±0.02	63.0	32 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	

32 HE 08B reports $0.39 \pm 0.07 \pm 0.05 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0 K^0 \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ
0.40±0.09 OUR AVERAGE				$[(0.41 \pm 0.09)\% \text{ OUR 2012 AVERAGE}]$	

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ
0.40±0.09±0.02	51.1	33 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	

33 HE 08B reports $0.38 \pm 0.07 \pm 0.04 \pm 0.03$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^- K^+ \pi^0 \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^*(892)^+ K^0 \pi^- \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
0.32±0.09±0.01	39.3	34 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	

34 HE 08B reports $0.30 \pm 0.07 \pm 0.04 \pm 0.02$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^+ K^0 \pi^- \rightarrow K^+ \pi^- K^0 \pi^0 + c.c.)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
0.14±0.05±0.01	22.9	35 HE	08B CLEO	$e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$	

35 HE 08B reports $0.13 \pm 0.04 \pm 0.02 \pm 0.01$ % from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \eta \pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	DOCUMENT ID	Γ_{14}/Γ
9.1±1.1 OUR FIT		

 $\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + c.c.)/\Gamma(K^+ K^- \pi^+ \pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{16}/Γ_{14}
0.25±0.13 OUR FIT				
0.25±0.13	TANENBAUM 78	MRK1	$\psi(2S) \rightarrow \gamma \chi_{c2}$	

 $\Gamma(K^+ \bar{K}^*(892)^0 \pi^- + c.c.)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	DOCUMENT ID	Γ_{16}/Γ
23±12 OUR FIT		

 $\Gamma(K^*(892)^0 \bar{K}^*(892)^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	DOCUMENT ID	Γ_{17}/Γ
2.5±0.5 OUR FIT		

NODE=M057R57
NODE=M057R57

NODE=M057R57;LINKAGE=HE

NODE=M057R52
NODE=M057R52

NODE=M057R52;LINKAGE=HE

NODE=M057R53
NODE=M057R53

NODE=M057R53;LINKAGE=HE

NODE=M057R54
NODE=M057R54

NODE=M057R54;LINKAGE=HE

NODE=M057R55
NODE=M057R55

NODE=M057R55;LINKAGE=HE

NODE=M057R3
NODE=M057R3

NODE=M057R39
NODE=M057R39

NODE=M057R9
NODE=M057R9

NODE=M057R26
NODE=M057R26

$\Gamma(3(\pi^+\pi^-))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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8.6±1.8 OUR EVALUATION**8.6±1.8 OUR AVERAGE** $8.6 \pm 0.9 \pm 1.6$ $8.7 \pm 5.9 \pm 0.4$

36 Rescaled by us using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$. Multiplied by a factor of 2 to convert from $K_S^0 K^+\pi^-$ to $K^0 K^+\pi^-$ decay.

 Γ_{18}/Γ

NODE=M057R4

NODE=M057R4

→ UNCHECKED ←

NODE=M057R;LINKAGE=X3

 $\Gamma(\phi\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
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1.16±0.10 OUR FIT[(1.14 ± 0.12) $\times 10^{-3}$ OUR 2012 FIT] Γ_{19}/Γ

NODE=M057R20

NODE=M057R20

NEW

 $\Gamma(\omega\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.92±0.11 OUR AVERAGE $0.89 \pm 0.11 \pm 0.03$ $1.9 \pm 0.6 \pm 0.1$ 27.7 ± 7.4

37 ABLIKIM 11K reports $(8.9 \pm 0.3 \pm 1.1) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

38 ABLIKIM 05N reports $[\Gamma(\chi_{c2}(1P) \rightarrow \omega\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] = (0.165 \pm 0.044 \pm 0.032) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 Γ_{20}/Γ

NODE=M057R28

NODE=M057R28

NODE=M057R28;LINKAGE=AL

NODE=M057R28;LINKAGE=AB

 $\Gamma(\omega\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<2.0

90

39 ABLIKIM

11K

BES3

 $\psi(2S) \rightarrow \gamma$ hadrons

39 ABLIKIM 11K reports $< 2 \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \omega\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

 Γ_{21}/Γ

NODE=M057R63

NODE=M057R63

NODE=M057R63;LINKAGE=AL

 $\Gamma(\pi\pi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>
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2.42±0.13 OUR FIT[(2.43 ± 0.13) $\times 10^{-3}$ OUR 2012 FIT] Γ_{22}/Γ

NODE=M057R27

NODE=M057R27

NEW

 $\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>
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40±17 OUR FIT Γ_{23}/Γ

NODE=M057R8

NODE=M057R8

 $\Gamma(\pi^+\pi^-\eta)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.52±0.14±0.02

40 ATHAR

07 CLEO

 $\psi(2S) \rightarrow \gamma h^+ h^- h^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.6

90

41 ABLIKIM

06R BES2

 $\psi(2S) \rightarrow \gamma\chi_{c2}$

40 ATHAR 07 reports $(0.49 \pm 0.12 \pm 0.06) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

41 ABLIKIM 06R reports $< 1.7 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

 Γ_{24}/Γ

NODE=M057R08

NODE=M057R08

NODE=M057R08;LINKAGE=AT

NODE=M057R08;LINKAGE=AB

$\Gamma(\pi^+\pi^-\eta')/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{25}/Γ
0.54±0.20 OUR AVERAGE	$[(0.55 \pm 0.20) \times 10^{-3}$ OUR 2012 AVERAGE]			NODE=M057R35 NODE=M057R35
0.54±0.20±0.02	42 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	NEW

42 ATHAR 07 reports $(0.51 \pm 0.18 \pm 0.06) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^-\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\eta\eta)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	Γ_{26}/Γ
5.9±0.5 OUR FIT		NODE=M057R16 NODE=M057R16

 $\Gamma(K^+K^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>DOCUMENT ID</u>	Γ_{27}/Γ
1.09±0.08 OUR FIT		NODE=M057R11 NODE=M057R11

 $\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>DOCUMENT ID</u>	Γ_{28}/Γ
0.58±0.05 OUR FIT		NODE=M057R19 NODE=M057R19

 $\Gamma(K_S^0 K_S^0)/\Gamma(\pi\pi)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{28}/Γ_{22}
0.239±0.019 OUR FIT				

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.27 ± 0.07 ± 0.04 43,44 CHEN 07B BELL $e^+e^- \rightarrow e^+e^-\chi_{c2}$

43 Using $\Gamma(\pi\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ from the $\pi^+\pi^-$ measurement of NAKAZAWA 05 rescaled by 3/2 to convert to $\pi\pi$.

44 Not independent from other measurements.

 $\Gamma(K_S^0 K_S^0)/\Gamma(K^+K^-)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{28}/Γ_{27}
0.53±0.05 OUR FIT				NODE=M057R37 NODE=M057R37

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.70±0.21±0.12 45,46 CHEN 07B BELL $e^+e^- \rightarrow e^+e^-\chi_{c2}$

45 Using $\Gamma(K^+K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ from NAKAZAWA 05.

46 Not independent from other measurements.

 $\Gamma(K^+K^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{30}/Γ
0.33±0.08±0.01	47 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	NODE=M057R05 NODE=M057R05

47 ATHAR 07 reports $(0.31 \pm 0.07 \pm 0.04) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(K^+K^-\eta)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{31}/Γ
<0.35	90	48 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	NODE=M057R09 NODE=M057R09

48 ATHAR 07 reports $< 0.33 \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

 $\Gamma(\eta\eta')/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{32}/Γ
<0.6	90	3.3 ± 8.0	49 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\eta\eta'$	NODE=M057R03 NODE=M057R03

• • • We do not use the following data for averages, fits, limits, etc. • • •

<2.5 90 50 ADAMS 07 CLEO $\psi(2S) \rightarrow \gamma\chi_{c2}$

49 ASNER 09 reports $< 0.6 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \eta\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

50 Superseded by ASNER 09. ADAMS 07 reports $< 2.3 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \eta\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 0.0933 \pm 0.0014 \pm 0.0061$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

$\Gamma(\eta'\eta')/\Gamma_{\text{total}}$						Γ_{33}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.1	90	12 ± 7	51 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\eta'\eta'$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<3.3	90	52 ADAMS	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c2}$	
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51 ASNER 09 reports $< 1.0 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \eta'\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

52 Superseded by ASNER 09. ADAMS 07 reports $< 3.1 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \eta'\eta')/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 0.0933 \pm 0.0014 \pm 0.0061$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

$\Gamma(\pi^+\pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}$						Γ_{34}/Γ
<u>VALUE (units 10^{-3})</u>		<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.4±0.6±0.1		57 ± 11	53 ABLIKIM	050 BES2	$\psi(2S) \rightarrow \gamma\chi_{c2}$	

53 ABLIKIM 050 reports $[\Gamma(\chi_{c2}(1P) \rightarrow \pi^+\pi^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] = (0.207 \pm 0.039 \pm 0.033) \times 10^{-3}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+K^- K_S^0 K_S^0)/\Gamma_{\text{total}}$						Γ_{35}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<4	90	2.3 ± 2.2	54 ABLIKIM	050 BES2	$e^+e^- \rightarrow \chi_{c2}\gamma$	
54 ABLIKIM 050 reports $[\Gamma(\chi_{c2}(1P) \rightarrow K^+K^- K_S^0 K_S^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] < 3.5 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.						

$\Gamma(K^+K^- K^+K^-)/\Gamma_{\text{total}}$						Γ_{36}/Γ
<u>VALUE (units 10^{-3})</u>		<u>DOCUMENT ID</u>				
1.78±0.22 OUR FIT						

$\Gamma(K^+K^-\phi)/\Gamma_{\text{total}}$						Γ_{37}/Γ
<u>VALUE (units 10^{-3})</u>		<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.54±0.32 OUR AVERAGE		$[(1.55 \pm 0.33) \times 10^{-3}$ OUR 2012 AVERAGE]				
1.54±0.32±0.06	52	55 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma K^+K^-$		

55 ABLIKIM 06T reports $(1.67 \pm 0.26 \pm 0.24) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$						Γ_{38}/Γ
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>				
0.71±0.04 OUR FIT						
$[(0.72 \pm 0.04) \times 10^{-4}$ OUR 2012 FIT]						

$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$						Γ_{39}/Γ
<u>VALUE (units 10^{-3})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.51±0.05 OUR AVERAGE						
0.51±0.04±0.02	56 ONYISI	10 CLE3	$\psi(2S) \rightarrow \gamma p\bar{p}X$			
0.47±0.10±0.02	57 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+h^-h^0$			

NODE=M057R03;LINKAGE=AS

NODE=M057R03;LINKAGE=AD

NODE=M057R04
NODE=M057R04

NODE=M057R04;LINKAGE=AS

NODE=M057R04;LINKAGE=AD

NODE=M057R31
NODE=M057R31

NODE=M057R32
NODE=M057R32

NODE=M057R32;LINKAGE=AB

NODE=M057R18
NODE=M057R18

NODE=M057R01
NODE=M057R01

NEW

NODE=M057R01;LINKAGE=AB

NODE=M057R12
NODE=M057R12

NEW

NODE=M057R06
NODE=M057R06

56 ONYISI 10 reports $(4.83 \pm 0.25 \pm 0.35 \pm 0.31) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

57 ATHER 07 reports $(0.44 \pm 0.08 \pm 0.05) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\eta)/\Gamma_{\text{total}}$	Γ_{40}/Γ			
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT	

0.189±0.028 OUR AVERAGE

$[(0.190 \pm 0.028) \times 10^{-3}$ OUR 2012 AVERAGE]

- | | | | | |
|-----------------------------|-----------|---------|---|--|
| 0.188 $\pm 0.028 \pm 0.007$ | 58 ONYISI | 10 CLE3 | $\psi(2S) \rightarrow \gamma p\bar{p}X$ | |
| 0.20 $\pm 0.08 \pm 0.01$ | 59 ATHER | 07 CLEO | $\psi(2S) \rightarrow \gamma h^+ h^- h^0$ | |
- 58 ONYISI 10 reports $(1.76 \pm 0.23 \pm 0.14 \pm 0.11) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.
- 59 ATHER 07 reports $(0.19 \pm 0.07 \pm 0.02) \times 10^{-3}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\eta)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\omega)/\Gamma_{\text{total}}$	Γ_{41}/Γ			
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT	

0.39±0.05±0.02

- | | | | | |
|--------------------------|-----------|---------|---|--|
| 0.39 $\pm 0.05 \pm 0.02$ | 60 ONYISI | 10 CLE3 | $\psi(2S) \rightarrow \gamma p\bar{p}X$ | |
|--------------------------|-----------|---------|---|--|
- 60 ONYISI 10 reports $(3.68 \pm 0.35 \pm 0.26 \pm 0.24) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\phi)/\Gamma_{\text{total}}$	Γ_{42}/Γ			
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT

3.0±0.9±0.1

- | | | | | |
|------------|------------|----------|---|--|
| 24 ± 7 | 61 ABLIKIM | 11F BES3 | $\psi(2S) \rightarrow \gamma p\bar{p}K^+ K^-$ | |
|------------|------------|----------|---|--|
- 61 ABLIKIM 11F reports $(3.04 \pm 0.85 \pm 0.43) \times 10^{-5}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{43}/Γ			
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT	

1.32±0.34 OUR EVALUATION

Treating systematic error as correlated.

1.3 ± 0.4 OUR AVERAGE

Error includes scale factor of 1.3.

- | | | | | |
|--------------------------|--------------|---------|--|--|
| 1.17 $\pm 0.19 \pm 0.30$ | 62 BAI | 99B BES | $\psi(2S) \rightarrow \gamma\chi_{c2}$ | |
| 2.64 $\pm 1.03 \pm 0.14$ | 62 TANENBAUM | 78 MRK1 | $\psi(2S) \rightarrow \gamma\chi_{c2}$ | |
- 62 Rescaled by us using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.6 \pm 0.5)\%$. Multiplied by a factor of 2 to convert from $K_S^0 K^+ \pi^-$ to $K^0 K^+ \pi^-$ decay.

$\Gamma(p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}$	Γ_{44}/Γ			
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT

0.085±0.026 OUR AVERAGE

$[(0.086 \pm 0.026)\% \text{ OUR 2012 AVERAGE}]$

0.085±0.025±0.003

- | | | | | |
|------|-------|----------|--|--|
| 29.2 | 63 HE | 08B CLEO | $e^+ e^- \rightarrow \gamma h^+ h^- h^0 h^0$ | |
|------|-------|----------|--|--|
- 63 HE 08B reports $0.08 \pm 0.02 \pm 0.01 \pm 0.01 \%$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}\pi^0\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M057R06;LINKAGE=ON

NODE=M057R06;LINKAGE=AT

NODE=M057R34
NODE=M057R34

NEW

NODE=M057R34;LINKAGE=ON

NODE=M057R34;LINKAGE=AT

NODE=M057R56
NODE=M057R56

NODE=M057R56;LINKAGE=ON

NODE=M057R62
NODE=M057R62

NODE=M057R62;LINKAGE=AB

NODE=M057R6
NODE=M057R6

→ UNCHECKED ←

NODE=M057R6;LINKAGE=X3

NODE=M057R49
NODE=M057R49

NEW

NODE=M057R49;LINKAGE=HE

$\Gamma(p\bar{p}K^+K^-(\text{non-resonant}))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{45}/Γ
2.08±0.35 OUR AVERAGE				$[(2.1 \pm 0.4) \times 10^{-4}$ OUR 2012 AVERAGE]	
2.08±0.34±0.08	131 ± 12	64 ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$	

64 ABLIKIM 11F reports $(2.08 \pm 0.19 \pm 0.30) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{p}K^+K^-(\text{non-resonant}))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M057R59
NODE=M057R59

NEW

NODE=M057R59;LINKAGE=AB

 $\Gamma(p\bar{p}K_S^0 K_S^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{46}/Γ
<7.9	90	65 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \chi_{c2}\gamma$	

65 Using $B(\psi(2S) \rightarrow \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$.

NODE=M057R30
NODE=M057R30

NODE=M057R;LINKAGE=AB

NODE=M057R33
NODE=M057R33

NODE=M057R33;LINKAGE=AB

 $\Gamma(p\bar{n}\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{47}/Γ
11.1±3.7±0.4	66 ABLIKIM	06I BES2	$\psi(2S) \rightarrow \gamma p\pi^- X$	

66 ABLIKIM 06I reports $[\Gamma(\chi_{c2}(1P) \rightarrow p\bar{n}\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] = (0.97 \pm 0.20 \pm 0.26) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M057R30
NODE=M057R30

NODE=M057R33;LINKAGE=AB

 $\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{48}/Γ
1.86±0.27 OUR FIT				

NODE=M057R25
NODE=M057R25 $\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{49}/Γ
<3.5	90	67 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \chi_{c2}\gamma$	

67 Using $B(\psi(2S) \rightarrow \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$.

NODE=M057R29
NODE=M057R29

NODE=M057R29;LINKAGE=AB

 $\Gamma(K^+\bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{50}/Γ
8.4±0.6 OUR AVERAGE				$[(0.91 \pm 0.18) \times 10^{-3}$ OUR 2012 AVERAGE]	

NODE=M057R07
NODE=M057R07

NEW

$8.4 \pm 0.6 \pm 0.3$	5k 68,69 ABLIKIM	13D BES3	$\psi(2S) \rightarrow \gamma\Lambda\bar{p}K^+$	
$9.1 \pm 1.7 \pm 0.4$	70 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma h^+ h^- h^0$	

68 ABLIKIM 13D reports $(8.4 \pm 0.3 \pm 0.6) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+\bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.72 \pm 0.34) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M057R29
NODE=M057R29

NODE=M057R29;LINKAGE=AB

69 Using $B(\Lambda \rightarrow p\pi^-) = 63.9\%$.

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{50}/Γ
70±1.4 OUR AVERAGE				$[(8.5 \pm 1.4 \pm 1.0) \times 10^{-4}$ OUR 2012 AVERAGE]	
$8.5 \pm 1.4 \pm 1.0$	70 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c2}(1P)$		

70 ATHAR 07 reports $(8.5 \pm 1.4 \pm 1.0) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+\bar{p}\Lambda + \text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M057R07
NODE=M057R07

NODE=M057R07;LINKAGE=AT

 $\Gamma(K^+\bar{p}\Lambda(1520)+\text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{51}/Γ
3.1±0.7±0.1	79 ± 13	71 ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p}K^+K^-$	

71 ABLIKIM 11F reports $(3.06 \pm 0.50 \pm 0.54) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow K^+\bar{p}\Lambda(1520)+\text{c.c.})/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))] \text{ assuming } B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M057R60
NODE=M057R60

NODE=M057R60;LINKAGE=AB

$\Gamma(\Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{52}/Γ
5.0±1.6 OUR AVERAGE	$[(5.1 \pm 1.6) \times 10^{-4}$ OUR 2012 AVERAGE]				
5.0±1.6±0.2	29 ± 7	72 ABLIKIM	11F BES3	$\psi(2S) \rightarrow \gamma p\bar{p} K^+ K^-$	

72 ABLIKIM 11F reports $(5.05 \pm 1.29 \pm 0.93) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \Lambda(1520)\bar{\Lambda}(1520))/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\Sigma^0\bar{\Sigma}^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{53}/Γ
<0.8	90	7.5 ± 3.4	73 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma\Sigma^0\bar{\Sigma}^0$	

73 NAIK 08 reports $< 0.75 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma^0\bar{\Sigma}^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

 $\Gamma(\Sigma^+\bar{\Sigma}^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{54}/Γ
<0.7	90	4.0 ± 3.5	74 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma\Sigma^+\bar{\Sigma}^-$	

74 NAIK 08 reports $< 0.67 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \Sigma^+\bar{\Sigma}^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

 $\Gamma(\Xi^0\bar{\Xi}^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{55}/Γ
<1.1	90	2.9 ± 1.7	75 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma\Xi^0\bar{\Xi}^0$	

75 NAIK 08 reports $< 1.06 \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \Xi^0\bar{\Xi}^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.

 $\Gamma(\Xi^-\bar{\Xi}^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{56}/Γ
1.55±0.34±0.06	29 ± 5	76 NAIK	08 CLEO	$\psi(2S) \rightarrow \gamma\Xi^-\bar{\Xi}^+$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 3.7	90	77 ABLIKIM	06D BES2	$\psi(2S) \rightarrow \chi_{c2}\gamma$		
76 NAIK 08 reports $(1.45 \pm 0.30 \pm 0.15) \times 10^{-4}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \Xi^-\bar{\Xi}^+)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (9.33 \pm 0.14 \pm 0.61) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.76 \pm 0.34) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.						

77 Using $B(\psi(2S) \rightarrow \chi_{c2}\gamma) = (9.3 \pm 0.6)\%$.

 $\Gamma(J/\psi(1S)\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{57}/Γ
<0.015	90	BARATE	81 SPEC	$190 \text{ GeV } \pi^- \text{ Be} \rightarrow 2\pi 2\mu$	

 $\Gamma(\eta_c(1S)\pi^+\pi^-)/\Gamma(K^0 K^+ \pi^- + \text{c.c.})$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{58}/Γ_{29}
<16.4	90	78 LEES	12AE BABR	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$	

78 We divided the reported limit by 2 to take into account the $K_L^0 K^+ \pi^-$ mode.

 RADIATIVE DECAYS

 $\Gamma(\gamma J/\psi(1S))/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{59}/Γ
0.198±0.008 OUR FIT				

[0.195 ± 0.008 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.199±0.005±0.012 79 ADAM 05A CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c2}$

79 Uses $B(\psi(2S) \rightarrow \gamma\chi_{c2} \rightarrow \gamma\gamma J/\psi)$ from ADAM 05A and $B(\psi(2S) \rightarrow \gamma\chi_{c2})$ from ATHAR 04.

NODE=M057R61
NODE=M057R61

NEW

NODE=M057R61;LINKAGE=AB

NODE=M057R43
NODE=M057R43

NODE=M057R43;LINKAGE=NA

NODE=M057R44
NODE=M057R44

NODE=M057R44;LINKAGE=NA

NODE=M057R45
NODE=M057R45

NODE=M057R45;LINKAGE=NA

NODE=M057R17
NODE=M057R17

NODE=M057R17;LINKAGE=NA

NODE=M057R17;LINKAGE=AB

NODE=M057R13
NODE=M057R13

NODE=M057R64
NODE=M057R64

NODE=M057R64;LINKAGE=LE

NODE=M057310

NODE=M057R7
NODE=M057R7
NEW

NODE=M057R7;LINKAGE=AD

$\Gamma(\gamma\rho^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{60}/Γ
<21	90	13 ± 11	80	ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\rho^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<50	90	17.2 ± 6.8	81	BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\rho^0$
80	ABLIKIM 11E reports $< 20.8 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.					
81	BENNETT 08A reports $< 50 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\rho^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.					

NODE=M057R40
NODE=M057R40 $\Gamma(\gamma\omega)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{61}/Γ
<6	90	1 ± 6	82	ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\omega$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<6	90	0.0 ± 1.8	83	BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\omega$
82	ABLIKIM 11E reports $< 6.1 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.					
83	BENNETT 08A reports $< 7.0 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\omega)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.					

NODE=M057R41
NODE=M057R41 $\Gamma(\gamma\phi)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{62}/Γ
< 8	90	5 ± 5	84	ABLIKIM	11E BES3	$\psi(2S) \rightarrow \gamma\gamma\phi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<12	90	1.3 ± 2.5	85	BENNETT	08A CLEO	$\psi(2S) \rightarrow \gamma\gamma\phi$
84	ABLIKIM 11E reports $< 8.1 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.74 \pm 0.35) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.					
85	BENNETT 08A reports $< 13 \times 10^{-6}$ from a measurement of $[\Gamma(\chi_{c2}(1P) \rightarrow \gamma\phi)/\Gamma_{\text{total}}] \times [B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))]$ assuming $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = (8.1 \pm 0.4) \times 10^{-2}$, which we rescale to our best value $B(\psi(2S) \rightarrow \gamma\chi_{c2}(1P)) = 8.76 \times 10^{-2}$.					

NODE=M057R42
NODE=M057R42 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>DOCUMENT ID</u>	Γ_{63}/Γ
2.61±0.16 OUR FIT		
$[(2.59 \pm 0.16) \times 10^{-4}$ OUR 2012 FIT]		

NODE=M057R1
NODE=M057R1
NEW $\Gamma(\gamma\gamma)/\Gamma(\gamma J/\psi(1S))$

<u>VALUE (units 10^{-3})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{63}/Γ_{59}
1.31±0.09 OUR FIT				
$[(1.33 \pm 0.09) \times 10^{-3}$ OUR 2012 FIT]				
0.99±0.18	86	AMBROGIANI 00B E835	$\bar{p}p \rightarrow \chi_{c2} \rightarrow \gamma\gamma, \gamma J/\psi$	

NODE=M057R23
NODE=M057R23
NEW $\Gamma(\gamma\gamma)/\Gamma_{\text{total}} \times \Gamma(p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-8})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{63}/\Gamma \times \Gamma_{38}/\Gamma$
1.85±0.18 OUR FIT				
$[(1.86 \pm 0.18) \times 10^{-8}$ OUR 2012 FIT]				
1.7 ± 0.4 OUR AVERAGE				
1.60±0.42	ARMSTRONG 93	E760	$\bar{p}p \rightarrow \gamma\gamma X$	
9.9 ± 4.5	BAGLIN 87B	SPEC	$\bar{p}p \rightarrow \gamma\gamma X$	

NODE=M057R;LINKAGE=7A

NODE=M057R24
NODE=M057R24
NEW

$\chi_{c2}(1P)$ CROSS-PARTICLE BRANCHING RATIOS

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- \pi^+ \pi^-) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}{\Gamma_{14} / \Gamma \times \Gamma_{120}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-3}) DOCUMENT ID TECN COMMENT

2.35±0.26 OUR FIT

$[(2.36 \pm 0.27) \times 10^{-3}$ OUR 2012 FIT]

2.5 ±0.9 OUR AVERAGE Error includes scale factor of 2.3.

1.90±0.14±0.44	BAI	99B	BES	$\psi(2S) \rightarrow \gamma \chi_{c2}$
3.8 ± 0.67	87	TANENBAUM	78	MRK1 $\psi(2S) \rightarrow \gamma \chi_{c2}$

87 The reported value is derived using $B(\psi(2S) \rightarrow \pi^+ \pi^- J/\psi) \times B(J/\psi \rightarrow \ell^+ \ell^-) = (4.6 \pm 0.7)\%$. Calculated by us using $B(J/\psi \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^*(892)^0 \bar{K}^*(892)^0) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma_{17} / \Gamma \times \Gamma_{120}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) DOCUMENT ID TECN COMMENT

2.2 ±0.4 OUR FIT

3.11±0.36±0.48

ABLIKIM 04H BES $\psi(2S) \rightarrow \gamma \chi_{c2}$

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow p \bar{p}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}{\Gamma_{38} / \Gamma \times \Gamma_{120}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-5}) DOCUMENT ID TECN COMMENT

1.83±0.13 OUR FIT

$[(1.86 \pm 0.14) \times 10^{-5}$ OUR 2012 FIT]

1.4 ± 1.1	88	BAI	98I	BES $\psi(2S) \rightarrow \gamma \chi_{c2} \rightarrow \gamma \bar{p} p$
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88 Calculated by us. The value for $B(\chi_{c2} \rightarrow p \bar{p})$ reported in BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow p \bar{p}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma_{38} / \Gamma \times \Gamma_{120}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-6}) EVTS DOCUMENT ID TECN COMMENT

6.2±0.5 OUR FIT

$[(6.3 \pm 0.5) \times 10^{-6}$ OUR 2012 FIT]

6.7±1.1 OUR AVERAGE Error includes scale factor of 1.5.

7.2±0.7±0.4	121 ± 12	89	NAIK	08 CLEO $\psi(2S) \rightarrow \gamma p \bar{p}$
4.4 ± 1.6 ± 0.6	14.3 ± 5.2	4.7	BAI	04F BES $\psi(2S) \rightarrow \gamma \chi_{c2}(1P) \rightarrow \gamma \bar{p} p$

89 Calculated by us. NAIK 08 reports $B(\chi_{c2} \rightarrow p \bar{p}) = (7.7 \pm 0.8 \pm 0.4 \pm 0.5) \times 10^{-5}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \Lambda \bar{\Lambda}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}}{\Gamma_{48} / \Gamma \times \Gamma_{120}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-6}) EVTS DOCUMENT ID TECN COMMENT

16.3±2.3 OUR FIT

15.9±2.1±1.0

71 ± 9 90 NAIK 08 CLEO $\psi(2S) \rightarrow \gamma \Lambda \bar{\Lambda}$

90 Calculated by us. NAIK 08 reports $B(\chi_{c2} \rightarrow \Lambda \bar{\Lambda}) = (17.0 \pm 2.2 \pm 1.1 \pm 1.1) \times 10^{-5}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \Lambda \bar{\Lambda}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}{\Gamma_{48} / \Gamma \times \Gamma_{120}^{\psi(2S)} / \Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

4.8±0.7 OUR FIT

7.1 ± 3.1	8.3 ± 3.7	91	BAI	03E BES $\psi(2S) \rightarrow \gamma \Lambda \bar{\Lambda}$
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91 BAI 03E reports $[B(\chi_{c2} \rightarrow \Lambda \bar{\Lambda}) B(\psi(2S) \rightarrow \gamma \chi_{c2}) / B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-)] \times [B^2(\Lambda \rightarrow \pi^- p) / B(J/\psi \rightarrow p \bar{p})] = (1.33 \pm 0.59 \pm 0.25)\%$. We calculate from this measurement the presented value using $B(\Lambda \rightarrow \pi^- p) = (63.9 \pm 0.5)\%$ and $B(J/\psi \rightarrow p \bar{p}) = (2.17 \pm 0.07) \times 10^{-3}$.

NODE=M057230

NODE=M057B18

NODE=M057B18

NEW

NODE=M057B18;LINKAGE=TA

NODE=M057B19

NODE=M057B19

NODE=M057B1

NODE=M057B1

NEW

NODE=M057B;LINKAGE=J8

NODE=M057B6

NODE=M057B6

NEW

NODE=M057B6;LINKAGE=NA

NODE=M057B10

NODE=M057B10

NODE=M057B10;LINKAGE=NA

NODE=M057B11

NODE=M057B11

NODE=M057B11;LINKAGE=BA

$$\Gamma(\chi_{c2}(1P) \rightarrow \pi\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{22}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.12±0.08 OUR FIT				
$[(2.11 \pm 0.08) \times 10^{-4}$ OUR 2012 FIT]				
2.17±0.09 OUR AVERAGE				
2.19±0.05±0.15	4.5k	92 ABLIKIM	10A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c2}$
2.23±0.06±0.10	2.5k	93 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$
1.90±0.08±0.20	0.8k	94 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$
92 Calculated by us. ABLIKIM 10A reports $B(\chi_{c2} \rightarrow \pi^0\pi^0) = (0.88 \pm 0.02 \pm 0.06 \pm 0.04) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$. We have multiplied the $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.				
93 Calculated by us. ASNER 09 reports $B(\chi_{c2} \rightarrow \pi^+\pi^-) = (1.59 \pm 0.04 \pm 0.07 \pm 0.10) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$. We have multiplied the $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.				
94 Calculated by us. ASNER 09 reports $B(\chi_{c2} \rightarrow \pi^0\pi^0) = (0.68 \pm 0.03 \pm 0.07 \pm 0.04) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$. We have multiplied the $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.				

NODE=M057B02
NODE=M057B02
NEW

OCCUR=2
NODE=M057B02;LINKAGE=AB
NODE=M057B02;LINKAGE=AS
NODE=M057B02;LINKAGE=AN

$$\Gamma(\chi_{c2}(1P) \rightarrow \pi\pi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$$

$$\Gamma_{22}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.622±0.024 OUR FIT				
$[(0.629 \pm 0.024) \times 10^{-3}$ OUR 2012 FIT]				
0.54 ±0.06 OUR AVERAGE				
0.66 ±0.18 ±0.37	21 ± 6	95 BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$
0.54 ±0.05 ±0.04	185 ± 16	96 BAI	98I BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$
95 We have multiplied $\pi^0\pi^0$ measurement by 3 to obtain $\pi\pi$.				
96 Calculated by us. The value for $B(\chi_{c2} \rightarrow \pi^+\pi^-)$ reported by BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D]. We have multiplied $\pi^+\pi^-$ measurement by 3/2 to obtain $\pi\pi$.				

NODE=M057B9
NODE=M057B9
NEW

NODE=M057B;LINKAGE=BM
NODE=M057B;LINKAGE=BA

$$\Gamma(\chi_{c2}(1P) \rightarrow \eta\eta)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{26}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.52±0.04 OUR FIT					
0.52±0.04 OUR AVERAGE					
0.54±0.03±0.04	386	97 ABLIKIM	10A BES3	$e^+e^- \rightarrow \psi(2S) \rightarrow \gamma\chi_{c2}$	
0.47±0.05±0.05	156 ± 14	ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma\eta\eta$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.44	90	98 ADAMS	07 CLEO	$\psi(2S) \rightarrow \gamma\chi_{c2}$	
< 3	90	BAI	03C BES	$\psi(2S) \rightarrow \gamma\eta\eta \rightarrow 5\gamma$	
0.62±0.31±0.19		LEE	85 CBAL	$\psi(2S) \rightarrow \text{photons}$	
97 Calculated by us. ABLIKIM 10A reports $B(\chi_{c2} \rightarrow \eta\eta) = (0.65 \pm 0.04 \pm 0.05 \pm 0.03) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (8.3 \pm 0.4)\%$.					
98 Superseded by ASNER 09.					

NODE=M057B04
NODE=M057B04

NODE=M057B04;LINKAGE=AB
NODE=M057B04;LINKAGE=AD

$$\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{27}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
9.5±0.6 OUR FIT				
10.5±0.3±0.6	1.6k	99 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma K^+K^-$
99 Calculated by us. ASNER 09 reports $B(\chi_{c2} \rightarrow K^+K^-) = (1.13 \pm 0.03 \pm 0.06 \pm 0.07) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.				

NODE=M057B03
NODE=M057B03

NODE=M057B03;LINKAGE=AS

$$\Gamma(\chi_{c2}(1P) \rightarrow K^+K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)$$

$$\Gamma_{27}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
0.280±0.017 OUR FIT				
$[(0.283 \pm 0.017) \times 10^{-3}$ OUR 2012 FIT]				
0.190±0.034±0.019	115 ± 13	100 BAI	98I BES	$\psi(2S) \rightarrow \gamma K^+K^-$
100 Calculated by us. The value for $B(\chi_{c2} \rightarrow K^+K^-)$ reported by BAI 98I is derived using $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].				

NODE=M057B8
NODE=M057B8
NEW

NODE=M057B;LINKAGE=BI

$$\Gamma(\chi_{c2}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{28}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
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5.1 ±0.4 OUR FIT**5.0 ±0.4 OUR AVERAGE**

4.9 ± 0.3 ± 0.3	373 ± 20	101 ASNER	09 CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
$5.72 \pm 0.76 \pm 0.63$	65	ABLIKIM	050 BES2	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
101 Calculated by us. ASNER 09 reports $B(\chi_{c2} \rightarrow K_S^0 K_S^0) = (0.53 \pm 0.03 \pm 0.03 \pm 0.03) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.				

NODE=M057B12

NODE=M057B12

$$\Gamma(\chi_{c2}(1P) \rightarrow K_S^0 K_S^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)$$

$$\Gamma_{28}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
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14.9±1.1 OUR FIT[(15.0 ± 1.1) × 10⁻⁵ OUR 2012 FIT]

14.7±4.1±3.3	102 BAI	99B BES	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
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102 Calculated by us. The value of $B(\chi_{c2} \rightarrow K_S^0 K_S^0)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

NODE=M057B13

NODE=M057B13

NEW

$$\Gamma(\chi_{c2}(1P) \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{29}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.22±0.17 OUR FIT**1.15±0.18 OUR AVERAGE**

1.21 ± 0.19 ± 0.09	37	103 ATHAR	07 CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp$
0.97 ± 0.32 ± 0.13	28	104 ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp$

103 Calculated by us. ATHAR 07 reports $B(\chi_{c2} \rightarrow \bar{K}^0 K^+ \pi^- + \text{c.c.}) = (1.3 \pm 0.2 \pm 0.1 \pm 0.1) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (9.33 \pm 0.14 \pm 0.61)\%$.

104 Calculated by us. ABLIKIM 06R reports $B(\chi_{c2} \rightarrow K_S^0 K^\pm \pi^\mp) = (0.6 \pm 0.2 \pm 0.1) \times 10^{-3}$ using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (8.1 \pm 0.6)\%$. We have multiplied by 2 to obtain $\bar{K}^0 K^+ \pi^- + \text{c.c.}$ from $K_S^0 K^\pm \pi^\mp$.

NODE=M057B05

NODE=M057B05

$$\Gamma(\chi_{c2}(1P) \rightarrow 2(\pi^+ \pi^-))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)$$

$$\Gamma_1/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
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2.84±0.27 OUR FIT[(2.86 ± 0.27) × 10⁻³ OUR 2012 FIT]

3.1 ±1.0 OUR AVERAGE Error includes scale factor of 2.5.

2.3 ± 0.1 ± 0.5	105 BAI	99B BES	$\psi(2S) \rightarrow \gamma \chi_{c2}$
4.3 ± 0.6	106 TANENBAUM	78 MRK1	$\psi(2S) \rightarrow \gamma \chi_{c2}$

105 Calculated by us. The value for $B(\chi_{c2} \rightarrow 2\pi^+ 2\pi^-)$ reported in BAI 99B is derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

106 The value for $B(\psi(2S) \rightarrow \gamma \chi_{c2}) \times B(\chi_{c2} \rightarrow 2\pi^+ \pi^-)$ reported in TANENBAUM 78 is derived using $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) \times B(J/\psi(1S) \ell^+ \ell^-) = (4.6 \pm 0.7)\%$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

NODE=M057B5

NODE=M057B5

NEW

NODE=M057B;LINKAGE=K1

NODE=M057B;LINKAGE=K2

$$\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}$$

$$\Gamma_{36}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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1.56±0.19 OUR FIT[(1.55 ± 0.19) × 10⁻⁴ OUR 2012 FIT]

1.76±0.16±0.24	160	107 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma 2K^+ 2K^-$
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107 Calculated by us. The value of $B(\chi_{c2} \rightarrow 2K^+ 2K^-)$ reported by ABLIKIM 06T was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.1 \pm 0.4)\%$.

NODE=M057B14

NODE=M057B14

NEW

NODE=M057B14;LINKAGE=AB

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow K^+ K^- K^+ K^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))}{\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)} / \frac{\Gamma_{36}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) DOCUMENT ID TECN COMMENT

4.6±0.5 OUR FIT

$[(4.6 \pm 0.6) \times 10^{-4}$ OUR 2012 FIT]

3.6±0.6±0.6 108 BAI 99B BES $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$

108 Calculated by us. The value of $B(\chi_{c2} \rightarrow 2K^+ 2K^-)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}}{\Gamma_{19}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) EVTS DOCUMENT ID TECN COMMENT

1.01±0.08 OUR FIT

$[(1.00 \pm 0.10) \times 10^{-4}$ OUR 2012 FIT]

0.98±0.13 OUR AVERAGE Error includes scale factor of 1.3.

0.94±0.03±0.10	849	109 ABLIKIM	11K BES3	$\psi(2S) \rightarrow \gamma$ hadrons
1.38±0.24±0.23	41	110 ABLIKIM	06T BES2	$\psi(2S) \rightarrow \gamma 2K^+ 2K^-$

109 Calculated by us. The value of $B(\chi_{c2} \rightarrow \phi\phi)$ reported by ABLIKIM 11K was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.74 \pm 0.35)\%$.

110 Calculated by us. The value of $B(\chi_{c2} \rightarrow \phi\phi)$ reported by ABLIKIM 06T was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (8.1 \pm 0.4)\%$.

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)}{\Gamma_{19}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-4}) DOCUMENT ID TECN COMMENT

2.98±0.25 OUR FIT

$[(2.96 \pm 0.29) \times 10^{-4}$ OUR 2012 FIT]

4.8 ±1.3 ±1.3 111 BAI 99B BES $\psi(2S) \rightarrow \gamma 2K^+ 2K^-$

111 Calculated by us. The value of $B(\chi_{c2} \rightarrow \phi\phi)$ reported by BAI 99B was derived using $B(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) = (7.8 \pm 0.8)\%$ and $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = (32.4 \pm 2.6)\%$ [BAI 98D].

$$\frac{\Gamma(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P))/\Gamma_{\text{total}}}{\Gamma_{59}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}}$$

VALUE (units 10^{-2}) EVTS DOCUMENT ID TECN COMMENT

1.74 ±0.04 OUR FIT

$[(1.70 \pm 0.04) \times 10^{-2}$ OUR 2012 FIT]

1.52 ±0.15 OUR AVERAGE Error includes scale factor of 2.6. See the ideogram below.

$[(1.34 \pm 0.14) \times 10^{-2}$ OUR 2012 AVERAGE Scale factor = 1.9]

1.874±0.007±0.102	76k	ABLIKIM	120 BES3	$\psi(2S) \rightarrow \gamma \chi_{c2}$
1.62 ±0.04 ±0.12	5.8k	BAI	04I BES2	$\psi(2S) \rightarrow J/\psi \gamma \gamma$
0.99 ±0.10 ±0.08		GAISER	86 CBAL	$\psi(2S) \rightarrow \gamma X$
1.47 ±0.17		112 OREGLIA	82 CBAL	$\psi(2S) \rightarrow \gamma \chi_{c2}$
1.8 ±0.5		113 BRANDELIK	79B DASP	$\psi(2S) \rightarrow \gamma \chi_{c2}$
1.2 ±0.2		113 BARTEL	78B CNTR	$\psi(2S) \rightarrow \gamma \chi_{c2}$
2.2 ±1.2		114 BIDDICK	77 CNTR	$e^+ e^- \rightarrow \gamma X$
1.2 ±0.7		112 WHITAKER	76 MRK1	$e^+ e^- \rightarrow \gamma X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.95 ±0.02 ±0.07	12.4k	115 MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2}$
1.85 ±0.04 ±0.07	1.9k	116 ADAM	05A CLEO	Repl. by MENDEZ 08

112 Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

113 Recalculated by us using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$.

114 Assumes isotropic gamma distribution.

115 Not independent from other measurements of MENDEZ 08.

116 Not independent from other values reported by ADAM 05A.

NODE=M057B15

NODE=M057B15

NEW

NODE=M057B15;LINKAGE=BA

NODE=M057B16

NODE=M057B16

NEW

NODE=M057B16;LINKAGE=AL

NODE=M057B16;LINKAGE=AB

NODE=M057B17

NODE=M057B17

NEW

NODE=M057B17;LINKAGE=BA

NODE=M057B2

NODE=M057B2

NEW

NEW

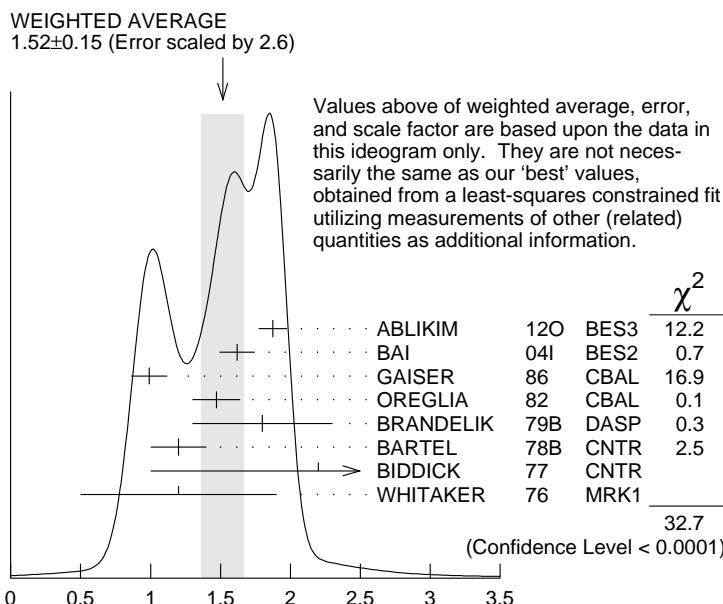
NODE=M057B;LINKAGE=3Q

NODE=M057B;LINKAGE=2Q

NODE=M057B;LINKAGE=EA

NODE=M057B2;LINKAGE=ME

NODE=M057B;LINKAGE=AD



$\Gamma(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}$ (units 10^{-2})

$\Gamma(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \text{anything})$

$$\begin{aligned} \Gamma_{59}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_9^{\psi(2S)} = \Gamma_{59}/\Gamma \times \Gamma_{120}^{\psi(2S)} / (\Gamma_{11}^{\psi(2S)} + \Gamma_{12}^{\psi(2S)} + \Gamma_{13}^{\psi(2S)} + \\ 0.348\Gamma_{119}^{\psi(2S)} + 0.198\Gamma_{120}^{\psi(2S)}) \end{aligned}$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.88±0.07 OUR FIT

$[(2.86 \pm 0.07) \times 10^{-2}$ OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

3.12±0.03±0.09	12.4k	117 MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2}$
3.11±0.07±0.07	1.9k	ADAM	05A CLEO	Repl. by MENDEZ 08

117 Not independent from other measurements of MENDEZ 08.

NODE=M057B7

NODE=M057B7

NODE=M057B7

NEW

NODE=M057B7;LINKAGE=ME

$\Gamma(\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-)$

$$\Gamma_{59}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma_{11}^{\psi(2S)}$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
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5.10±0.12 OUR FIT

$[(5.07 \pm 0.13) \times 10^{-2}$ OUR 2012 FIT]

5.53±0.17 OUR AVERAGE

5.56±0.05±0.16	12.4k	MENDEZ	08 CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2}$
6.0 ± 2.8	1.3k	118 ABLIKIM	04B BES	$\psi(2S) \rightarrow J/\psi X$
3.9 ± 1.2		119 HIMEL	80 MRK2	$\psi(2S) \rightarrow \gamma \chi_{c2}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

5.52±0.13±0.13	1.9k	120 ADAM	05A CLEO	Repl. by MENDEZ 08
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118 From a fit to the J/ψ recoil mass spectra.

119 The value for $B(\psi(2S) \rightarrow \gamma \chi_{c2}) \times B(\chi_{c2} \rightarrow \gamma J/\psi(1S))$ reported in HIMEL 80 is derived using $B(\psi(2S) \rightarrow J/\psi(1S) \pi^+ \pi^-) = (33 \pm 3)\%$ and $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.138 \pm 0.018$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = (0.1181 \pm 0.0020)$.

120 Not independent from other values reported by ADAM 05A.

NODE=M057B3

NODE=M057B3

NEW

NODE=M057B;LINKAGE=AB

NODE=M057B;LINKAGE=H8

NODE=M057B3;LINKAGE=AD

$\Gamma(\chi_{c2}(1P) \rightarrow \gamma \gamma) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \chi_{c2}(1P)) / \Gamma_{\text{total}}$

$$\Gamma_{63}/\Gamma \times \Gamma_{120}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
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2.28±0.16 OUR FIT

$[(2.26 \pm 0.16) \times 10^{-5}$ OUR 2012 FIT]

2.73±0.32 OUR AVERAGE

2.68±0.28±0.15	333 ± 35	ECKLUND	08A CLEO	$\psi(2S) \rightarrow \gamma \chi_{c2} \rightarrow 3\gamma$
7.0 ± 2.1 ± 2.0		LEE	85 CBAL	$\psi(2S) \rightarrow \gamma \chi_{c2}$

NODE=M057B4

NODE=M057B4

NEW

MULTIPOLE AMPLITUDES IN $\chi_{c2}(1P) \rightarrow \gamma J/\psi(1S)$ RADIATIVE DECAY

$a_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Magnetic quadrupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
-10.0 ± 1.5 OUR AVERAGE				
- 9.3 ± 1.6 ± 0.3	19.8k	121 ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
- 9.3 ± 3.9 ± 0.6	5.9k	122 AMBROGIANI 02	E835	$p\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$
- 14 ± 6	1.9k	122 ARMSTRONG 93E	E760	$p\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$
-33.3 ± 11.6 -29.2	441	122 OREGLIA 82	CBAL	$\psi(2S) \rightarrow \chi_{c1}\gamma \rightarrow J/\psi\gamma\gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

- 7.9 ± 1.9 ± 0.3	19.8k	123 ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
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121 From a fit with floating $M2$ amplitudes a_2 and b_2 , and fixed $E3$ amplitudes $a_3=b_3=0$.

122 Assuming $a_3=0$.

123 From a fit with floating $M2$ and $E3$ amplitudes a_2 , b_2 , and a_3 , and b_3 .

$a_3 = E3/\sqrt{E1^2 + M2^2 + E3^2}$ Electric octupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.6 ± 1.3 OUR AVERAGE				
1.7 ± 1.4 ± 0.3	19.8k	124 ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
2.0 ± 5.5 - 4.4 ± 0.9	5908	AMBROGIANI 02	E835	$p\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$
0 ± 6 - 5	1904	ARMSTRONG 93E	E760	$p\bar{p} \rightarrow \chi_{c2} \rightarrow J/\psi\gamma$

124 From a fit with floating $M2$ and $E3$ amplitudes a_2 , b_2 , and a_3 , and b_3 .

MULTIPOLE AMPLITUDES IN $\psi(2S) \rightarrow \gamma\chi_{c2}(1P)$ RADIATIVE DECAY

$b_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Magnetic quadrupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.2 ± 1.8 OUR AVERAGE Error includes scale factor of 1.7. See the ideogram below.				
4.6 ± 1.0 ± 1.3	13.8k	125 ABLIKIM 11I	BES3	$\psi(2S) \rightarrow \gamma\pi^+\pi^-, \gamma K^+K^-$
0.2 ± 1.5 ± 0.4	19.8k	126 ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
- 5.1 ± 5.4 - 3.6	721	125 ABLIKIM 04I	BES2	$\psi(2S) \rightarrow \gamma\pi^+\pi^-, \gamma K^+K^-$
13.2 ± 9.8 - 7.5	441	127 OREGLIA 82	CBAL	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.0 ± 1.3 ± 0.3	19.8k	127 ARTUSO 09	CLEO	$\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
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125 From a fit with floating $M2$ and $E3$ amplitudes b_2 and b_3 .

126 From a fit with floating $M2$ and $E3$ amplitudes a_2 , b_2 , and a_3 , and b_3 .

127 From a fit with floating $M2$ amplitudes a_2 and b_2 , and fixed $E3$ amplitudes $a_3=b_3=0$.

NODE=M057240

NODE=M057A1

NODE=M057A1

OCCUR=2

NODE=M057A1;LINKAGE=AR

NODE=M057A1;LINKAGE=A

NODE=M057A1;LINKAGE=AT

NODE=M057A2

NODE=M057A2

NODE=M057A2;LINKAGE=AR

NODE=M057250

NODE=M057QB2

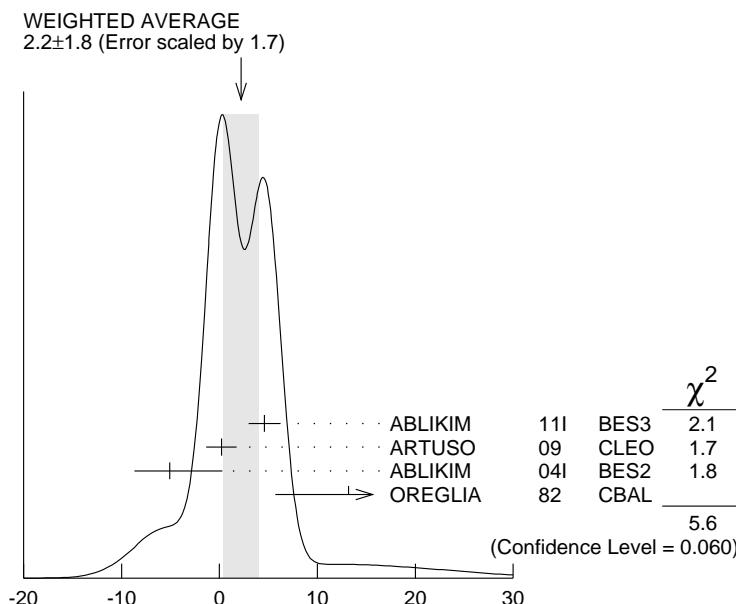
NODE=M057QB2

OCCUR=2

NODE=M057QB2;LINKAGE=AB

NODE=M057QB2;LINKAGE=AT

NODE=M057QB2;LINKAGE=AR



$b_2 = M2/\sqrt{E1^2 + M2^2 + E3^2}$ Magnetic quadrupole fractional transition amplitude (units 10^{-2})

$b_3 = E3/\sqrt{E1^2 + M2^2 + E3^2}$ Electric octupole fractional transition amplitude

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
-0.3±1.0 OUR AVERAGE				
1.5±0.8±1.8	13.8k	128	ABLIKIM	11I BES3 $\psi(2S) \rightarrow \gamma\pi^+\pi^-, \gamma K^+K^-$
-0.8±1.2±0.2	19.8k		ARTUSO	09 CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
-2.7 ^{+4.3} _{-2.9}	721	128	ABLIKIM	04I BES2 $\psi(2S) \rightarrow \gamma\pi^+\pi^-, \gamma K^+K^-$

128 From a fit with floating $M2$ and $E3$ amplitudes b_2 and b_3 .

NODE=M057QB3
NODE=M057QB3

MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS $\psi(2S) \rightarrow \gamma\chi_{c2}(1P)$ and $\chi_{c2} \rightarrow \gamma J/\psi(1S)$

b_2/a_2 Magnetic quadrupole transition amplitude ratio

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
-11⁺¹⁴₋₁₅	19.8k	129	ARTUSO	09 CLEO $\psi(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

129 Statistical and systematic errors combined. From a fit with floating $M2$ amplitudes a_2 and b_2 , and fixed $E3$ amplitudes $a_3=b_3=0$. Not independent of values for $a_2(\chi_{c2}(1P))$ and $b_2(\chi_{c2}(1P))$ from ARTUSO 09.

NODE=M057QB3;LINKAGE=AB

NODE=M057260

NODE=M057QAR
NODE=M057QAR

NODE=M057QAR;LINKAGE=AR

$\chi_{c2}(1P)$ REFERENCES

ABLIKIM	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54879
ABLIKIM	120	PRL 109 172002	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=54742
LEES	12AE	PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54752
LIU	12B	PRL 108 232001	Z.Q. Liu <i>et al.</i>	(BELLE Colab.)	REFID=54303
ABLIKIM	11A	PR D83 012006	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53647
ABLIKIM	11E	PR D83 112005	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=16717
ABLIKIM	11F	PR D83 112009	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=16719
ABLIKIM	11I	PR D84 092006	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53930
ABLIKIM	11K	PRL 107 092001	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53940
DEL-AMO-SA... ONIYISI	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=16751
ABLIKIM	10A	PR D81 052005	M. Ablikim <i>et al.</i>	(BES III Collab.)	REFID=53347
UEHARA	10A	PR D82 011103	P.U.E. Oniyisi <i>et al.</i>	(CLEO Collab.)	REFID=53360
ARTUSO	09	PR D82 114031	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=53641
ASNER	09	PR D79 072007	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=53206
UEHARA	09	PR D79 052009	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=52721
BENNETT	08A	PRL 101 151801	J.V. Bennett <i>et al.</i>	(CLEO Collab.)	REFID=52761
ECKLUND	08A	PR D78 091501	K.M. Ecklund <i>et al.</i>	(CLEO Collab.)	REFID=52575
HE	08B	PR D78 092004	Q. He <i>et al.</i>	(CLEO Collab.)	REFID=52583
MENDEZ	08	PR D78 011102	H. Mendez <i>et al.</i>	(CLEO Collab.)	REFID=52588
NAIK	08	PR D78 031101	P. Naik <i>et al.</i>	(CLEO Collab.)	REFID=52684
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)	REFID=52301
ADAMS	07	PR D75 071101	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=52064
ATHAR	07	PR D75 032002	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=51651
CHEN	07B	PL B651 15	W.T. Chen <i>et al.</i>	(BELLE Collab.)	REFID=51618
ABLIKIM	06D	PR D73 052006	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51710
ABLIKIM	06I	PR D74 012004	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51049
ABLIKIM	06R	PR D74 072001	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51126

NODE=M057

REFID=51447

ABLIKIM	06T	PL B642 197	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51453
DOBBS	06	PR D73 071101	S. Dobbs <i>et al.</i>	(CLEO Collab.)	REFID=51062
ABLIKIM	05G	PR D71 092002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50756
ABLIKIM	05N	PL B630 7	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50847
ABLIKIM	05O	PL B630 21	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50846
ADAM	05A	PRL 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)	REFID=50763
ANDREOTTI	05A	NP B717 34	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)	REFID=50769
NAKAZAWA	05	PL B615 39	H. Nakazawa <i>et al.</i>	(BELLE Collab.)	REFID=50807
ABLIKIM	04B	PR D70 012003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=49741
ABLIKIM	04H	PR D70 092003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50188
ABLIKIM	04I	PR D70 092004	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50189
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=50331
BAI	04F	PR D69 092001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49752
BAI	04I	PR D70 012006	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49755
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>	(KEDR Collab.)	REFID=49579
BAI	03C	PR D67 032004	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49190
BAI	03E	PR D67 112001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49416
ABE	02T	PL B540 33	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=48813
AMBROGIANI	02	PR D65 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=48552
EISENSTEIN	01	PRL 87 061801	B.I. Eisenstein <i>et al.</i>	(CLEO Collab.)	REFID=48344
AMBROGIANI	00B	PR D62 052002	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=47940
ACCIARRI	99E	PL B453 73	M. Acciarri <i>et al.</i>	(L3 Collab.)	REFID=46943
BAI	99B	PR D60 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47385
ACKER..K...	98	PL B439 197	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)	REFID=46324
BAI	98D	PR D58 092006	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46338
BAI	98I	PRL 81 3091	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46343
DOMINICK	94	PR D50 4265	J. Dominick <i>et al.</i>	(CLEO Collab.)	REFID=44077
ARMSTRONG	93	PRL 70 2988	T.A. Armstrong <i>et al.</i>	(FNAL E760 Collab.)	REFID=43306
ARMSTRONG	93E	PR D48 3037	T.A. Armstrong <i>et al.</i>	(FNAL-E760 Collab.)	REFID=48616
BAUER	93	PL B302 345	D.A. Bauer <i>et al.</i>	(TPC Collab.)	REFID=43315
ARMSTRONG	92	NP B373 35	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	REFID=41865
Also		PRL 68 1468	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	REFID=41907
BAGLIN	87B	PL B187 191	C. Baglin <i>et al.</i>	(R704 Collab.)	REFID=40018
BAGLIN	86B	PL B172 455	C. Baglin <i>et al.</i>	(LAPP, CERN, GENO, LYON, OSLO+)	REFID=22145
GAISER	86	PR D34 711	J. Gaisser <i>et al.</i>	(Crystal Ball Collab.)	REFID=22012
LEE	85	SLAC 282	R.A. Lee	(SLAC)	REFID=40589
LEMOIGNE	82	PL 113B 509	Y. Lemoigne <i>et al.</i>	(SACL, LOIC, SHMP+)	REFID=22084
OREGLIA	82	PR D25 2259	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)	REFID=22120
Also		Private Comm.	M.J. Oreglia	(IFI)	REFID=22143
BARATE	81	PR D24 2994	R. Barate <i>et al.</i>	(SACL, LOIC, SHMP, CERN+)	REFID=22164
HIMEL	80	PRL 44 920	T. Himel <i>et al.</i>	(LBL, SLAC)	REFID=22119
Also		Private Comm.	G. Trilling	(LBL, UCB)	REFID=22113
BRANDELIK	79B	NP B160 426	R. Brandelik <i>et al.</i>	(DASP Collab.)	REFID=22115
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)	REFID=22111
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL)	REFID=22112
Also		Private Comm.	G. Trilling	(LBL, UCB)	REFID=22113
BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)	REFID=22059
WHITAKER	76	PRL 37 1596	J.S. Whitaker <i>et al.</i>	(SLAC, LBL)	REFID=22151

$\eta_c(2S)$ $I^G(J^{PC}) = 0^+(0^-+)$

Quantum numbers are quark model predictions.

 $\eta_c(2S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3639.4±1.3 OUR AVERAGE	Error includes scale factor of 1.2. [3638.9 ± 1.3 MeV OUR 2012 AVERAGE]			
3646.9±1.6±3.6	57 ± 17	ABLIKIM	13K BES3	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$
3637.6±2.9±1.6	127 ± 18	¹ ABLIKIM	12G BES3	$\psi(2S) \rightarrow \gamma K^0 K\pi, KK\pi^0$
3638.5±1.5±0.8	624	² DEL-AMO-SA..11M BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$	
3640.5±3.2±2.5	1201	² DEL-AMO-SA..11M BABR	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	
3636.1 ^{+3.9+0.7} _{-4.2-2.0}	128	³ VINOKUROVA 11	BELL	$B^\pm \rightarrow K^\pm (K_S^0 K^\pm \pi^\mp)$
3626 ± 5 ± 6	311	⁴ ABE	07	BELL $e^+ e^- \rightarrow J/\psi(c\bar{c})$
3645.0±5.5 ^{+4.9} _{-7.8}	121 ± 27	AUBERT	05C BABR	$e^+ e^- \rightarrow J/\psi c\bar{c}$
3642.9±3.1±1.5	61	ASNER	04	CLEO $\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3639 ± 7	98 ± 52	⁵ AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
3630.8±3.4±1.0	112 ± 24	⁶ AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K\bar{K}\pi$
3654 ± 6 ± 8	39 ± 11	⁷ CHOI	02	BELL $B \rightarrow KK_S K^- \pi^+$
3594 ± 5		⁸ EDWARDS	82C CBAL	$e^+ e^- \rightarrow \gamma X$

1 From a simultaneous fit to $K_S^0 K^\pm \pi^\mp$ and $K^+ K^- \pi^0$ decay modes.

2 Ignoring possible interference with continuum.

3 Accounts for interference with non-resonant continuum.

4 From a fit of the J/ψ recoil mass spectrum. Supersedes ABE, K 02 and ABE 04G.

5 From the fit of the kaon momentum spectrum. Systematic errors not evaluated.

6 Superseded by DEL-AMO-SANCHEZ 11M.

7 Superseded by VINOKUROVA 11.

8 Assuming mass of $\psi(2S) = 3686$ MeV.

NODE=M059

NODE=M059

NODE=M059M

NODE=M059M

NEW

OCCUR=2

NODE=M059M;LINKAGE=AB
 NODE=M059M;LINKAGE=DE
 NODE=M059M;LINKAGE=VA
 NODE=M059M;LINKAGE=EB
 NODE=M059M;LINKAGE=AU
 NODE=M059M;LINKAGE=AR
 NODE=M059M;LINKAGE=CH
 NODE=M059M;LINKAGE=A

 $\eta_c(2S)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
11.3^{+ 3.2}_{- 2.9} OUR AVERAGE	[10 ± 4 MeV OUR 2012 AVERAGE]				
9.9 ± 4.8 ± 2.9	57 ± 17	ABLIKIM	13K BES3	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$	
16.9 ± 6.4 ± 4.8	127 ± 18	⁹ ABLIKIM	12G BES3	$\psi(2S) \rightarrow \gamma K^0 K\pi, KK\pi^0$	
13.4 ± 4.6 ± 3.2	624	¹⁰ DEL-AMO-SA..11M BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$		
6.6 ^{+ 8.4+2.6} _{- 5.1-0.9}	128	¹¹ VINOKUROVA 11	BELL	$B^\pm \rightarrow K^\pm (K_S^0 K^\pm \pi^\mp)$	
6.3 ± 12.4 ± 4.0	61	ASNER	04	CLEO $\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 23	90	98 ± 52	¹² AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
22 ± 14		121 ± 27	AUBERT	05C BABR	$e^+ e^- \rightarrow J/\psi c\bar{c}$
17.0 ± 8.3 ± 2.5		112 ± 24	¹³ AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K\bar{K}\pi$
< 55	90	39 ± 11	¹⁴ CHOI	02	BELL $B \rightarrow KK_S K^- \pi^+$
< 8.0	95		¹⁵ EDWARDS	82C CBAL	$e^+ e^- \rightarrow \gamma X$

9 From a simultaneous fit to $K_S^0 K^\pm \pi^\mp$ and $K^+ K^- \pi^0$ decay modes.

10 Ignoring possible interference with continuum.

11 Accounts for interference with non-resonant continuum.

12 From the fit of the kaon momentum spectrum. Systematic errors not evaluated.

13 Superseded by DEL-AMO-SANCHEZ 11M.

14 For a mass value of 3654 ± 6 MeV. Superseded by VINOKUROVA 11.

15 For a mass value of 3594 ± 5 MeV

NODE=M059W;LINKAGE=AB
 NODE=M059W;LINKAGE=DE
 NODE=M059W;LINKAGE=VA
 NODE=M059W;LINKAGE=AU
 NODE=M059W;LINKAGE=AR
 NODE=M059W;LINKAGE=CH
 NODE=M059W;LINKAGE=A

$\eta_c(2S)$ DECAY MODES

NODE=M059215;NODE=M059

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 hadrons	not seen	
Γ_2 $K\bar{K}\pi$	(1.9 ± 1.2) %	
Γ_3 $2\pi^+ 2\pi^-$	not seen	
Γ_4 $\rho^0 \rho^0$	not seen	
Γ_5 $3\pi^+ 3\pi^-$	not seen	
Γ_6 $K^+ K^- \pi^+ \pi^-$	not seen	
Γ_7 $K^{*0} \bar{K}^{*0}$	not seen	
Γ_8 $K^+ K^- \pi^+ \pi^- \pi^0$	(1.4 ± 1.0) %	
Γ_9 $K^+ K^- 2\pi^+ 2\pi^-$	not seen	
Γ_{10} $K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$	seen	
Γ_{11} $2K^+ 2K^-$	not seen	
Γ_{12} $\phi\phi$	not seen	
Γ_{13} $p\bar{p}$	$< 2.9 \times 10^{-4}$	90%
Γ_{14} $\gamma\gamma$	(1.9 ± 1.3) $\times 10^{-4}$	
Γ_{15} $\pi^+ \pi^- \eta$	not seen	
Γ_{16} $\pi^+ \pi^- \eta'$	not seen	
Γ_{17} $K^+ K^- \eta$	not seen	
Γ_{18} $\pi^+ \pi^- \eta_c(1S)$	< 25 %	90%

 $\eta_c(2S)$ PARTIAL WIDTHS

$\Gamma(\gamma\gamma)$	Γ_{14}
VALUE (keV)	DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.3 \pm 0.6 16 ASNER 04 CLEO $\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$

16 They measure $\Gamma(\eta_c(2S)\gamma\gamma) B(\eta_c(2S) \rightarrow K\bar{K}\pi) = (0.18 \pm 0.05 \pm 0.02) \Gamma(\eta_c(1S)\gamma\gamma) B(\eta_c(1S) \rightarrow K\bar{K}\pi)$. The value for $\Gamma(\eta_c(2S) \rightarrow \gamma\gamma)$ is derived assuming that the branching fractions for $\eta_c(2S)$ and $\eta_c(1S)$ decays to $K_S K\pi$ are equal and using $\Gamma(\eta_c(1S) \rightarrow \gamma\gamma) = 7.4 \pm 0.4 \pm 2.3$ keV.

$\eta_c(2S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$			
$\Gamma(2\pi^+ 2\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_3 \Gamma_{14}/\Gamma$		
VALUE (eV) CL% DOCUMENT ID TECN COMMENT			
<6.5 90 UEHARA 08 BELL $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow 2(\pi^+ \pi^-)$			

$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$			
$\Gamma_2 \Gamma_{14}/\Gamma$			
VALUE (eV) EVTS DOCUMENT ID TECN COMMENT			
41 \pm 4 \pm 6 624 17 DEL-AMO-SA..11M BABR $\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$			

17 Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

$\Gamma(K^+ K^- \pi^+ \pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$			
$\Gamma_6 \Gamma_{14}/\Gamma$			
VALUE (eV) CL% DOCUMENT ID TECN COMMENT			
<5.0 90 UEHARA 08 BELL $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K^+ K^- \pi^+ \pi^-$			

$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$			
$\Gamma_8 \Gamma_{14}/\Gamma$			
VALUE (eV) EVTS DOCUMENT ID TECN COMMENT			
30 \pm 6 \pm 5 1201 18 DEL-AMO-SA..11M BABR $\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$			

18 Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

$\Gamma(2K^+ 2K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$			
$\Gamma_{11} \Gamma_{14}/\Gamma$			
VALUE (eV) CL% DOCUMENT ID TECN COMMENT			
<2.9 90 UEHARA 08 BELL $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow 2(K^+ K^-)$			

$\Gamma(\pi^+ \pi^- \eta_c(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$			
$\Gamma_{18} \Gamma_{14}/\Gamma$			
VALUE (eV) CL% DOCUMENT ID TECN COMMENT			
<133 90 LEES 12AE BABR $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$			

DESIG=1

DESIG=4

DESIG=5

DESIG=16

DESIG=8;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=6

DESIG=17

DESIG=9

DESIG=10;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=11

DESIG=7

DESIG=18

DESIG=3

DESIG=2

DESIG=12;OUR EVAL; \rightarrow UNCHECKED \leftarrow DESIG=13;OUR EVAL; \rightarrow UNCHECKED \leftarrow DESIG=14;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=15

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NODE=M059218

NODE=M059G01
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NODE=M059G04;LINKAGE=DE

NODE=M059G02
NODE=M059G02NODE=M059G05
NODE=M059G05

NODE=M059G05;LINKAGE=DE

NODE=M059G03
NODE=M059G03NODE=M059G06
NODE=M059G06

$\eta_c(2S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma^2(\text{total})$ $\Gamma(p\bar{p})/\Gamma_{\text{total}} \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_{13}/\Gamma \times \Gamma_{14}/\Gamma$

VALUE (units 10^{-8})	CL%	DOCUMENT ID	TECN	COMMENT
< 5.6	90	19,20,21	AMBROGIANI 01	E835 $\bar{p}p \rightarrow \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 8.0	90	19,20,22	AMBROGIANI 01	E835 $\bar{p}p \rightarrow \gamma\gamma$
<12.0	90	20,22	AMBROGIANI 01	E835 $\bar{p}p \rightarrow \gamma\gamma$
19 Including the measurements of of ARMSTRONG 95F in the AMBROGIANI 01 analysis.				
20 For a total width $\Gamma=5$ MeV.				
21 For the resonance mass region $3589\text{--}3599$ MeV/ c^2 .				
22 For the resonance mass region $3575\text{--}3660$ MeV/ c^2 .				

 $\eta_c(2S) \text{ BRANCHING RATIOS}$ $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE		DOCUMENT ID	TECN	COMMENT
not seen		ABREU	980	DLPH $e^+e^- \rightarrow e^+e^- + \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	23	EDWARDS	82C	CBAL $e^+e^- \rightarrow \gamma X$

23 For a mass value of 3594 ± 5 MeV $\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.9±0.4±1.1	59 ± 12	24 AUBERT	08AB	BABR $B \rightarrow \eta_c(2S)K \rightarrow K\bar{K}\pi K$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

seen	127 ± 18	ABLIKIM	13K	BES3 $\psi(2S) \rightarrow \gamma K\bar{K}\pi$
seen	39 ± 11	25 CHOI	02	BELL $B \rightarrow KK_S K^- \pi^+$

24 Derived from a measurement of $[B(B^+ \rightarrow \eta_c(2S)K^+) \times B(\eta_c(2S) \rightarrow K\bar{K}\pi)] / [B(B^+ \rightarrow \eta_c K^+) \times B(\eta_c \rightarrow K\bar{K}\pi)] = (9.6^{+2.0}_{-1.9} \pm 2.5)\%$ and using $B(B^+ \rightarrow \eta_c(2S)K^+) = (3.4 \pm 1.8) \times 10^{-4}$, and $[B(B^+ \rightarrow \eta_c K^+) \times B(\eta_c \rightarrow K\bar{K}\pi)] = (6.88 \pm 0.77^{+0.55}_{-0.66}) \times 10^{-5}$.

25 For a mass value of 3654 ± 6 MeV $\Gamma(2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE		DOCUMENT ID	TECN	COMMENT
not seen		UEHARA	08	BELL $\gamma\gamma \rightarrow \eta_c(2S)$

 $\Gamma(\rho^0 \rho^0)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE		DOCUMENT ID	TECN	COMMENT
not seen		ABLIKIM	11H	BES3 $\psi(2S) \rightarrow \gamma 2\pi^+ 2\pi^-$

 $\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE		DOCUMENT ID	TECN	COMMENT
not seen		UEHARA	08	BELL $\gamma\gamma \rightarrow \eta_c(2S)$

 $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma(K\bar{K}\pi)$ Γ_8/Γ_2

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.73±0.17±0.17	1201	26 DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

26 We have multiplied the value of $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma(K_S^0 K^\pm \pi^\mp)$ reported in DEL-AMO-SANCHEZ 11M by a factor 1/3 to obtain $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma(K\bar{K}\pi)$. Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

 $\Gamma(K^{*0} \bar{K}^{*0})/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE		DOCUMENT ID	TECN	COMMENT
not seen		ABLIKIM	11H	BES3 $\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$

 $\Gamma(K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
seen	57 ± 17	ABLIKIM	13K	BES3 $\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$

 $\Gamma(2K^+ 2K^-)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE		DOCUMENT ID	TECN	COMMENT
not seen		UEHARA	08	BELL $\gamma\gamma \rightarrow \eta_c(2S)$

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NODE=M059G1

NODE=M059G1

OCCUR=2

OCCUR=3

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NODE=M059G1;LINKAGE=B

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NODE=M059G1;LINKAGE=C2

NODE=M059220

NODE=M059R1

NODE=M059R1

NODE=M059R;LINKAGE=W

NODE=M059R3

NODE=M059R3

NODE=M059R3;LINKAGE=AU

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NODE=M059R16

NODE=M059R16

NODE=M059R22

NODE=M059R22

NODE=M059R03

NODE=M059R03

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE	DOCUMENT ID	TECN	COMMENT		
not seen	ABLIKIM	11H	BES3	$\psi(2S) \rightarrow \gamma K^+ K^- K^+ K^-$	

NODE=M059R17
NODE=M059R17

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$<5 \times 10^{-4}$	90	27 WICHT	08	BELL	$B^\pm \rightarrow K^\pm \gamma\gamma$
not seen		AMBROGIANI	01	E835	$\bar{p}p \rightarrow \gamma\gamma$
<0.01	90	LEE	85	CBAL	$\psi' \rightarrow \text{photons}$
27 WICHT 08 reports $[\Gamma(\eta_c(2S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c(2S)K^+)] < 0.18 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta_c(2S)K^+) = 3.4 \times 10^{-4}$.					

NODE=M059R2
NODE=M059R2

$\Gamma(\pi^+\pi^-\eta_c(1S))/\Gamma(K\bar{K}\pi)$					Γ_{18}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<3.33	90	28 LEES	12AE	BABR	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-\eta_c$

NODE=M059R23
NODE=M059R23

28 We divided the reported limit by 3 to take into account isospin relations.

$\eta_c(2S)$ CROSS-PARTICLE BRANCHING RATIOS

$$\Gamma(\eta_c(2S) \rightarrow 2\pi^+ 2\pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_3/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<14.6 \times 10^{-6}$	90	29 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma 2\pi^+ 2\pi^-$

NODE=M059R05
NODE=M059R05

29 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\Gamma(\eta_c(2S) \rightarrow \rho^0 \rho^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_4/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<12.7 \times 10^{-7}$	90	ABLIKIM	11H	BES3

NODE=M059R18
NODE=M059R18

$$\Gamma(\eta_c(2S) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_5/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<13.2 \times 10^{-6}$	90	30 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma 3\pi^+ 3\pi^-$

NODE=M059R06
NODE=M059R06

30 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\Gamma(\eta_c(2S) \rightarrow K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_6/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<9.6 \times 10^{-6}$	90	31 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$

NODE=M059R07
NODE=M059R07

31 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\Gamma(\eta_c(2S) \rightarrow K^{*0} \bar{K}^{*0})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_7/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<19.6 \times 10^{-7}$	90	ABLIKIM	11H	BES3

NODE=M059R07;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_8/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<43.0 \times 10^{-6}$	90	32 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^- \pi^0$

NODE=M059R19
NODE=M059R19

32 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R08
NODE=M059R08

NODE=M059R08;LINKAGE=CR

$$\frac{\Gamma(\eta_c(2S) \rightarrow K^+ K^- 2\pi^+ 2\pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_9/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<9.7 \times 10^{-6}$	90	33 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K^+ K^- 2\pi^+ 2\pi^-$

33 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\frac{\Gamma(\eta_c(2S) \rightarrow K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_{10}/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE (units 10^{-6})	CL% EVTS	DOCUMENT ID	TECN	COMMENT
$7.03 \pm 2.10 \pm 0.7$	60	ABLIKIM	13K	BES3 $\psi(2S) \rightarrow \gamma K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 15.2	90	34 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$

34 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\frac{\Gamma(\eta_c(2S) \rightarrow \phi\phi)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_{12}/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<7.8 \times 10^{-7}$	90	ABLIKIM	11H	BES3 $\psi(2S) \rightarrow \gamma K^+ K^- K^+ K^-$

$$\frac{\Gamma(\eta_c(2S) \rightarrow \pi^+ \pi^- \eta)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_{15}/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4.3 \times 10^{-6}$	90	35 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta$

35 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\frac{\Gamma(\eta_c(2S) \rightarrow \pi^+ \pi^- \eta')/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_{16}/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<14.2 \times 10^{-6}$	90	36 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta'$

36 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\frac{\Gamma(\eta_c(2S) \rightarrow K^+ K^- \eta)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_{17}/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.9 \times 10^{-6}$	90	37 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K^+ K^- \eta$

37 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$$\frac{\Gamma(\eta_c(2S) \rightarrow \pi^+ \pi^- \eta_c(1S))/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S))/\Gamma_{\text{total}}}{\Gamma_{18}/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma^{\psi(2S)}}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.7 \times 10^{-4}$	90	38 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta_c(1S)$

38 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

$\eta_c(2S)$ REFERENCES

ABLIKIM	13K	PR D87 052005	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12G	PRL 109 042003	M. Ablikim <i>et al.</i>	(BES III Collab.)
LEES	12AE	PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ABLIKIM	11H	PR D84 091102	M. Ablikim <i>et al.</i>	(BES III Collab.)
DEL-AMO-SA... 11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	
VINOUKROVA	11	PL B706 139	A. Vinokurova <i>et al.</i>	(BELLE Collab.)
CRONIN-HEN... 10	PR D81 052002	D. Cronin-Hennessey <i>et al.</i>	(CLEO Collab.)	
AUBERT	08AB	PR D78 012006	B. Aubert <i>et al.</i>	(BABAR Collab.)
UEHARA	08	EPJ C53 1	S. Uehara <i>et al.</i>	(BELLE Collab.)
WICHT	08	PL B662 323	J. Wicht <i>et al.</i>	(BELLE Collab.)
ABE	07	PRL 98 082001	K. Abe <i>et al.</i>	(BELLE Collab.)
AUBERT	06E	PRL 96 052002	B. Aubert <i>et al.</i>	(BABAR Collab.)

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AUBERT	05C	PR D72 031101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50773
ABE	04G	PR D70 071102	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=50182
ASNER	04	PRL 92 142001	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=49745
AUBERT	04D	PRL 92 142002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=49746
ABE,K	02	PRL 89 142001	K. Abe <i>et al.</i>	(BELLE Collab.)	REFID=49188
CHOI	02	PRL 89 102001	S.-K. Choi <i>et al.</i>	(BELLE Collab.)	REFID=48760
AMBROGIANI	01	PR D64 052003	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=48340
ABREU	980	PL B441 479	P. Abreu <i>et al.</i>	(DELPHI Collab.)	REFID=46553
ARMSTRONG	95F	PR D52 4839	T.A. Armstrong <i>et al.</i>	(FNAL, FERR, GENO+)	REFID=44623
LEE	85	SLAC 282	R.A. Lee	(SLAC)	REFID=40589
EDWARDS	82C	PRL 48 70	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=22173

$\psi(2S)$

$$\Gamma^G(J^{PC}) = 0^-(1^- \bar{--})$$

See the Review on “ $\psi(2S)$ and χ_c branching ratios” before the $\chi_{c0}(1P)$ Listings.

$\psi(2S)$ MASS

OUR FIT includes measurements of $m_{\psi(2S)}$, $m_{\psi(3770)}$, and $m_{\psi(3770)} - m_{\psi(2S)}$.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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3686.109^{+0.012}_{-0.014} OUR FIT**3686.108^{+0.011}_{-0.014} OUR AVERAGE**

3686.12	± 0.06	4k	AAIJ	12H LHCb $p\bar{p} \rightarrow J/\psi \pi^+ \pi^- X$
3686.114 ± 0.007	$^{+0.011}_{-0.016}$	1 ANASHIN	12 KEDR	$e^+ e^- \rightarrow \text{hadrons}$
3686.111 ± 0.025	± 0.009	AULCHENKO 03	KEDR	$e^+ e^- \rightarrow \text{hadrons}$
3685.95	± 0.10	413	ARTAMONOV 00	OLYA $e^+ e^- \rightarrow \text{hadrons}$
3685.98	± 0.09	± 0.04	3 ARMSTRONG 93B	E760 $\bar{p}p \rightarrow e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

3686.00	± 0.10	413	ZHOLENTZ 80	OLYA $e^+ e^-$
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¹ From the scans in 2004 and 2006. ANASHIN 12 reports the value $3686.114 \pm 0.007 \pm 0.011^{+0.002}_{-0.012}$ MeV, where the third uncertainty is due to assumptions on the interference between the resonance and hadronic continuum. We combined the two systematic uncertainties.

² Reanalysis of ZHOLENTZ 80 using new electron mass (COHEN 87) and radiative corrections (KURAEV 85).

³ Mass central value and systematic error recalculated by us according to Eq. (16) in ARMSTRONG 93B, using the value for the $J/\psi(1S)$ mass from AULCHENKO 03.

⁴ Superseded by ARTAMONOV 00.

$m_{\psi(2S)} - m_{J/\psi(1S)}$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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589.188 ± 0.028 OUR AVERAGE

589.194 $\pm 0.027 \pm 0.011$	1 AULCHENKO 03	KEDR	$e^+ e^- \rightarrow \text{hadrons}$
589.7	± 1.2	LEMOIGNE 82	GOLI 185 $\pi^- \text{Be} \rightarrow \gamma \mu^+ \mu^- \text{A}$
589.07	± 0.13	¹ ZHOLENTZ 80	OLYA $e^+ e^-$
588.7	± 0.8	LUTH 75	MRK1

• • • We do not use the following data for averages, fits, limits, etc. • • •

588	± 1	² BAI	98E BES $e^+ e^-$
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¹ Redundant with data in mass above.

² Systematic errors not evaluated.

$\psi(2S)$ WIDTH

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
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303 ± 9 OUR FIT[304 ± 9 keV OUR 2012 FIT]**286 ± 16 OUR AVERAGE**

358 $\pm 88 \pm 4$	ABLIKIM 08B	BES2	$e^+ e^- \rightarrow \text{hadrons}$
290 $\pm 25 \pm 4$	ANDREOTTI 07	E835	$p\bar{p} \rightarrow e^+ e^-, J/\psi X$
331 $\pm 58 \pm 2$	ABLIKIM 06L	BES2	$e^+ e^- \rightarrow \text{hadrons}$
264 ± 27	¹ BAI	02B BES2	$e^+ e^-$
287 $\pm 37 \pm 16$	² ARMSTRONG 93B	E760	$\bar{p}p \rightarrow e^+ e^-$

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¹ From a simultaneous fit to the hadronic and $\mu^+ \mu^-$ cross section, assuming $\Gamma = \Gamma_h + \Gamma_e + \Gamma_\mu + \Gamma_\tau$ and lepton universality. Does not include vacuum polarization correction.

² The initial-state radiation correction reevaluated by ANDREOTTI 07 in its Ref. [4].

$\psi(2S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
Γ_1 hadrons	(97.85 \pm 0.13) %		DESIG=3
Γ_2 virtual $\gamma \rightarrow$ hadrons	(1.73 \pm 0.14) %	S=1.5	DESIG=4
Γ_3 $g g g$	(10.6 \pm 1.6) %		DESIG=255
Γ_4 $\gamma g g$	(1.03 \pm 0.29) %		DESIG=256
Γ_5 light hadrons	(15.4 \pm 1.5) %		DESIG=226
Γ_6 $e^+ e^-$	(7.82 \pm 0.17) $\times 10^{-3}$		DESIG=1
Γ_7 $\mu^+ \mu^-$	(7.8 \pm 0.9) $\times 10^{-3}$		DESIG=2
Γ_8 $\tau^+ \tau^-$	(3.1 \pm 0.4) $\times 10^{-3}$		DESIG=68
Decays into $J/\psi(1S)$ and anything			
Γ_9 $J/\psi(1S)$ anything	(60.3 \pm 0.7) %		NODE=M071;CLUMP=A
Γ_{10} $J/\psi(1S)$ neutrals	(24.9 \pm 0.4) %		DESIG=11
Γ_{11} $J/\psi(1S) \pi^+ \pi^-$	(34.0 \pm 0.4) %		DESIG=12
Γ_{12} $J/\psi(1S) \pi^0 \pi^0$	(17.93 \pm 0.33) %		DESIG=13
Γ_{13} $J/\psi(1S) \eta$	(3.33 \pm 0.05) %		DESIG=14
Γ_{14} $J/\psi(1S) \pi^0$	(1.268 \pm 0.032) $\times 10^{-3}$		DESIG=15
Hadronic decays			
Γ_{15} $\pi^0 h_c(1P)$	(8.6 \pm 1.3) $\times 10^{-4}$		NODE=M071;CLUMP=B
Γ_{16} $3(\pi^+ \pi^-) \pi^0$	(3.5 \pm 1.6) $\times 10^{-3}$		DESIG=254
Γ_{17} $2(\pi^+ \pi^-) \pi^0$	(2.9 \pm 1.0) $\times 10^{-3}$		DESIG=37
Γ_{18} $\rho a_2(1320)$	(2.6 \pm 0.9) $\times 10^{-4}$		DESIG=25
Γ_{19} $p \bar{p}$	(2.75 \pm 0.12) $\times 10^{-4}$		DESIG=65
Γ_{20} $\Delta^{++} \bar{\Delta}^{--}$	(1.28 \pm 0.35) $\times 10^{-4}$		DESIG=27
Γ_{21} $\Lambda \bar{\Lambda} \pi^0$	< 2.9 $\times 10^{-6}$	CL=90%	DESIG=70
Γ_{22} $\Lambda \bar{\Lambda} \eta$	(2.5 \pm 0.4) $\times 10^{-5}$		DESIG=238
Γ_{23} $\Lambda \bar{p} K^+$	(1.00 \pm 0.14) $\times 10^{-4}$		DESIG=239
Γ_{24} $\Lambda \bar{p} K^+ \pi^+ \pi^-$	(1.8 \pm 0.4) $\times 10^{-4}$		DESIG=214
Γ_{25} $\Lambda \bar{\Lambda} \pi^+ \pi^-$	(2.8 \pm 0.6) $\times 10^{-4}$		DESIG=215
Γ_{26} $\Lambda \bar{\Lambda}$	(2.8 \pm 0.5) $\times 10^{-4}$		DESIG=213
Γ_{27} $\Sigma^0 \bar{p} K^+ +$ c.c.	(1.67 \pm 0.18) $\times 10^{-5}$		DESIG=28
Γ_{28} $\Sigma^+ \bar{\Sigma}^-$	(2.6 \pm 0.8) $\times 10^{-4}$		DESIG=274
Γ_{29} $\Sigma^0 \bar{\Sigma}^0$	(2.2 \pm 0.4) $\times 10^{-4}$		DESIG=223
Γ_{30} $\Sigma(1385)^+ \bar{\Sigma}(1385)^-$	(1.1 \pm 0.4) $\times 10^{-4}$		DESIG=71
Γ_{31} $\Xi^- \bar{\Xi}^+$	(1.8 \pm 0.6) $\times 10^{-4}$		DESIG=72
Γ_{32} $\Xi^0 \bar{\Xi}^0$	(2.8 \pm 0.9) $\times 10^{-4}$		DESIG=29
Γ_{33} $\Xi(1530)^0 \bar{\Xi}(1530)^0$	< 8.1 $\times 10^{-5}$	CL=90%	DESIG=224
Γ_{34} $\Omega^- \bar{\Omega}^+$	< 7.3 $\times 10^{-5}$	CL=90%	DESIG=73
Γ_{35} $\pi^0 p \bar{p}$	(1.53 \pm 0.07) $\times 10^{-4}$		DESIG=74
Γ_{36} $N(940) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(6.4 \pm 1.8) $\times 10^{-5}$		DESIG=35
Γ_{37} $N(1440) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(7.3 \pm 1.7) $\times 10^{-5}$	S=2.5	DESIG=267
Γ_{38} $N(1520) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(6.4 \pm 2.3) $\times 10^{-6}$		DESIG=261
Γ_{39} $N(1535) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(2.5 \pm 1.0) $\times 10^{-5}$		DESIG=268
Γ_{40} $N(1650) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(3.8 \pm 1.4) $\times 10^{-5}$		DESIG=269
Γ_{41} $N(1720) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(1.79 \pm 0.26) $\times 10^{-5}$		DESIG=270
Γ_{42} $N(2300) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(2.6 \pm 1.2) $\times 10^{-5}$		DESIG=271
Γ_{43} $N(2570) \bar{p} +$ c.c. $\rightarrow \pi^0 p \bar{p}$	(2.13 \pm 0.40) $\times 10^{-5}$		DESIG=272
Γ_{44} $\pi^0 f_0(2100) \rightarrow \pi^0 p \bar{p}$	(1.1 \pm 0.4) $\times 10^{-5}$		DESIG=273
Γ_{45} $\eta p \bar{p}$	(5.7 \pm 0.6) $\times 10^{-5}$		DESIG=262
Γ_{46} $\eta f_0(2100) \rightarrow \eta p \bar{p}$	(1.2 \pm 0.4) $\times 10^{-5}$		DESIG=200
Γ_{47} $N(1535) \bar{p} \rightarrow \eta p \bar{p}$	(4.4 \pm 0.7) $\times 10^{-5}$		DESIG=263
			DESIG=264

Γ_{48}	$\omega p\bar{p}$	$(6.9 \pm 2.1) \times 10^{-5}$	DESIG=77
Γ_{49}	$\phi p\bar{p}$	$< 2.4 \times 10^{-5}$	CL=90% DESIG=80
Γ_{50}	$\pi^+ \pi^- p\bar{p}$	$(6.0 \pm 0.4) \times 10^{-4}$	DESIG=31
Γ_{51}	$p\bar{n} \pi^-$ or c.c.	$(2.48 \pm 0.17) \times 10^{-4}$	DESIG=227
Γ_{52}	$p\bar{n} \pi^- \pi^0$	$(3.2 \pm 0.7) \times 10^{-4}$	DESIG=228
Γ_{53}	$2(\pi^+ \pi^- \pi^0)$	$(4.7 \pm 1.5) \times 10^{-3}$	DESIG=221
Γ_{54}	$\eta \pi^+ \pi^-$	$< 1.6 \times 10^{-4}$	CL=90% DESIG=202
Γ_{55}	$\eta \pi^+ \pi^- \pi^0$	$(9.5 \pm 1.7) \times 10^{-4}$	DESIG=203
Γ_{56}	$2(\pi^+ \pi^-) \eta$	$(1.2 \pm 0.6) \times 10^{-3}$	DESIG=251
Γ_{57}	$\eta' \pi^+ \pi^- \pi^0$	$(4.5 \pm 2.1) \times 10^{-4}$	DESIG=204
Γ_{58}	$\omega \pi^+ \pi^-$	$(7.3 \pm 1.2) \times 10^{-4}$	S=2.1 DESIG=75
Γ_{59}	$b_1^\pm \pi^\mp$	$(4.0 \pm 0.6) \times 10^{-4}$	S=1.1 DESIG=40
Γ_{60}	$b_1^0 \pi^0$	$(2.4 \pm 0.6) \times 10^{-4}$	DESIG=193
Γ_{61}	$\omega f_2(1270)$	$(2.2 \pm 0.4) \times 10^{-4}$	DESIG=64
Γ_{62}	$\pi^+ \pi^- K^+ K^-$	$(7.5 \pm 0.9) \times 10^{-4}$	S=1.9 DESIG=26
Γ_{63}	$\rho^0 K^+ K^-$	$(2.2 \pm 0.4) \times 10^{-4}$	DESIG=205
Γ_{64}	$K^*(892)^0 \bar{K}_2^*(1430)^0$	$(1.9 \pm 0.5) \times 10^{-4}$	DESIG=66
Γ_{65}	$K^+ K^- \pi^+ \pi^- \eta$	$(1.3 \pm 0.7) \times 10^{-3}$	DESIG=252
Γ_{66}	$K^+ K^- 2(\pi^+ \pi^-) \pi^0$	$(1.00 \pm 0.31) \times 10^{-3}$	DESIG=240
Γ_{67}	$K^+ K^- 2(\pi^+ \pi^-)$	$(1.9 \pm 0.9) \times 10^{-3}$	DESIG=222
Γ_{68}	$K_1(1270)^\pm K^\mp$	$(1.00 \pm 0.28) \times 10^{-3}$	DESIG=41
Γ_{69}	$K_S^0 K_S^0 \pi^+ \pi^-$	$(2.2 \pm 0.4) \times 10^{-4}$	DESIG=225
Γ_{70}	$\rho^0 p\bar{p}$	$(5.0 \pm 2.2) \times 10^{-5}$	DESIG=210
Γ_{71}	$K^+ \bar{K}^*(892)^0 \pi^- +$ c.c.	$(6.7 \pm 2.5) \times 10^{-4}$	DESIG=34
Γ_{72}	$2(\pi^+ \pi^-)$	$(2.4 \pm 0.6) \times 10^{-4}$	S=2.2 DESIG=24
Γ_{73}	$\rho^0 \pi^+ \pi^-$	$(2.2 \pm 0.6) \times 10^{-4}$	S=1.4 DESIG=33
Γ_{74}	$K^+ K^- \pi^+ \pi^- \pi^0$	$(1.26 \pm 0.09) \times 10^{-3}$	DESIG=206
Γ_{75}	$\omega f_0(1710) \rightarrow \omega K^+ K^-$	$(5.9 \pm 2.2) \times 10^{-5}$	DESIG=216
Γ_{76}	$K^*(892)^0 K^- \pi^+ \pi^0 +$ c.c.	$(8.6 \pm 2.2) \times 10^{-4}$	DESIG=217
Γ_{77}	$K^*(892)^+ K^- \pi^+ \pi^- +$ c.c.	$(9.6 \pm 2.8) \times 10^{-4}$	DESIG=218
Γ_{78}	$K^*(892)^+ K^- \rho^0 +$ c.c.	$(7.3 \pm 2.6) \times 10^{-4}$	DESIG=219
Γ_{79}	$K^*(892)^0 K^- \rho^+ +$ c.c.	$(6.1 \pm 1.8) \times 10^{-4}$	DESIG=220
Γ_{80}	$\eta K^+ K^-$, no $\eta\phi$	$(3.1 \pm 0.4) \times 10^{-5}$	DESIG=207
Γ_{81}	$\omega K^+ K^-$	$(1.85 \pm 0.25) \times 10^{-4}$	S=1.1 DESIG=76
Γ_{82}	$3(\pi^+ \pi^-)$	$(3.5 \pm 2.0) \times 10^{-4}$	S=2.8 DESIG=32
Γ_{83}	$p\bar{p} \pi^+ \pi^- \pi^0$	$(7.3 \pm 0.7) \times 10^{-4}$	DESIG=211
Γ_{84}	$K^+ K^-$	$(7.1 \pm 0.5) \times 10^{-5}$	S=1.5 DESIG=23
Γ_{85}	$K_S^0 K_L^0$	$(5.34 \pm 0.33) \times 10^{-5}$	DESIG=85
Γ_{86}	$\pi^+ \pi^- \pi^0$	$(2.01 \pm 0.17) \times 10^{-4}$	S=1.7 DESIG=36
Γ_{87}	$\rho(2150) \pi \rightarrow \pi^+ \pi^- \pi^0$	$(1.9 \pm 1.2) \times 10^{-4}$	DESIG=201
Γ_{88}	$\rho(770) \pi \rightarrow \pi^+ \pi^- \pi^0$	$(3.2 \pm 1.2) \times 10^{-5}$	S=1.8 DESIG=22
Γ_{89}	$\pi^+ \pi^-$	$(7.8 \pm 2.6) \times 10^{-6}$	DESIG=21
Γ_{90}	$K_1(1400)^\pm K^\mp$	$< 3.1 \times 10^{-4}$	CL=90% DESIG=42
Γ_{91}	$K_2^*(1430)^\pm K^\mp$	$(7.1 \pm 1.3) \times 10^{-5}$	DESIG=265
Γ_{92}	$K^+ K^- \pi^0$	$(4.07 \pm 0.31) \times 10^{-5}$	DESIG=38
Γ_{93}	$K^+ K^*(892)^- +$ c.c.	$(2.9 \pm 0.4) \times 10^{-5}$	S=1.2 DESIG=39
Γ_{94}	$K^*(892)^0 \bar{K}^0 +$ c.c.	$(1.09 \pm 0.20) \times 10^{-4}$	DESIG=194
Γ_{95}	$\phi \pi^+ \pi^-$	$(1.17 \pm 0.29) \times 10^{-4}$	S=1.7 DESIG=78
Γ_{96}	$\phi f_0(980) \rightarrow \pi^+ \pi^-$	$(6.8 \pm 2.4) \times 10^{-5}$	S=1.1 DESIG=81
Γ_{97}	$2(K^+ K^-)$	$(6.0 \pm 1.4) \times 10^{-5}$	DESIG=208
Γ_{98}	$\phi K^+ K^-$	$(7.0 \pm 1.6) \times 10^{-5}$	DESIG=79
Γ_{99}	$2(K^+ K^-) \pi^0$	$(1.10 \pm 0.28) \times 10^{-4}$	DESIG=209
Γ_{100}	$\phi \eta$	$(3.10 \pm 0.31) \times 10^{-5}$	DESIG=89
Γ_{101}	$\phi \eta'$	$(3.1 \pm 1.6) \times 10^{-5}$	DESIG=90
Γ_{102}	$\omega \eta'$	$(3.2 \pm 2.5) \times 10^{-5}$	DESIG=91
Γ_{103}	$\omega \pi^0$	$(2.1 \pm 0.6) \times 10^{-5}$	DESIG=92
Γ_{104}	$\rho \eta'$	$(1.9 \pm 1.7) \times 10^{-5}$	DESIG=93

Γ_{105}	$\rho\eta$	(2.2 \pm 0.6) \times 10 ⁻⁵	S=1.1	DESIG=94
Γ_{106}	$\omega\eta$	< 1.1 \times 10 ⁻⁵	CL=90%	DESIG=95
Γ_{107}	$\phi\pi^0$	< 4 \times 10 ⁻⁷	CL=90%	DESIG=96
Γ_{108}	$\eta_c\pi^+\pi^-\pi^0$	< 1.0 \times 10 ⁻³	CL=90%	DESIG=229
Γ_{109}	$p\bar{p}K^+K^-$	(2.7 \pm 0.7) \times 10 ⁻⁵		DESIG=212
Γ_{110}	$\bar{\Lambda}nK_S^0 + \text{c.c.}$	(8.1 \pm 1.8) \times 10 ⁻⁵		DESIG=237
Γ_{111}	$\phi f'_2(1525)$	(4.4 \pm 1.6) \times 10 ⁻⁵		DESIG=67
Γ_{112}	$\Theta(1540)\bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.}$	< 8.8 \times 10 ⁻⁶	CL=90%	DESIG=195
Γ_{113}	$\Theta(1540)K^-\bar{n} \rightarrow K_S^0 p K^- \bar{n}$	< 1.0 \times 10 ⁻⁵		DESIG=196
Γ_{114}	$\Theta(1540)K_S^0\bar{p} \rightarrow K_S^0\bar{p}K^+n$	< 7.0 \times 10 ⁻⁶	CL=90%	DESIG=197
Γ_{115}	$\bar{\Theta}(1540)K^+n \rightarrow K_S^0\bar{p}K^+n$	< 2.6 \times 10 ⁻⁵	CL=90%	DESIG=198
Γ_{116}	$\bar{\Theta}(1540)K_S^0p \rightarrow K_S^0pK^-\bar{n}$	< 6.0 \times 10 ⁻⁶	CL=90%	DESIG=199
Γ_{117}	$K_S^0K_S^0$	< 4.6 \times 10 ⁻⁶		DESIG=86

Radiative decays

Γ_{118}	$\gamma\chi_{c0}(1P)$	(9.84 \pm 0.31) %	NODE=M071;CLUMP=C	
Γ_{119}	$\gamma\chi_{c1}(1P)$	(9.3 \pm 0.4) %	DESIG=58	
Γ_{120}	$\gamma\chi_{c2}(1P)$	(8.76 \pm 0.34) %	DESIG=59	
Γ_{121}	$\gamma\eta_c(1S)$	(3.4 \pm 0.5) \times 10 ⁻³	S=1.3	DESIG=61
Γ_{122}	$\gamma\eta_c(2S)$	(7 \pm 5) \times 10 ⁻⁴		DESIG=63
Γ_{123}	$\gamma\pi^0$	(1.6 \pm 0.4) \times 10 ⁻⁶		DESIG=52
Γ_{124}	$\gamma\eta'(958)$	(1.23 \pm 0.06) \times 10 ⁻⁴		DESIG=54
Γ_{125}	$\gamma f_2(1270)$	(2.1 \pm 0.4) \times 10 ⁻⁴		DESIG=82
Γ_{126}	$\gamma f_0(1710)$			DESIG=236
Γ_{127}	$\gamma f_0(1710) \rightarrow \gamma\pi\pi$	(3.0 \pm 1.3) \times 10 ⁻⁵		DESIG=83
Γ_{128}	$\gamma f_0(1710) \rightarrow \gamma K\bar{K}$	(6.0 \pm 1.6) \times 10 ⁻⁵		DESIG=84
Γ_{129}	$\gamma\gamma$	< 1.4 \times 10 ⁻⁴	CL=90%	DESIG=51
Γ_{130}	$\gamma\eta$	(1.4 \pm 0.5) \times 10 ⁻⁶		DESIG=53
Γ_{131}	$\gamma\eta\pi^+\pi^-$	(8.7 \pm 2.1) \times 10 ⁻⁴		DESIG=230
Γ_{132}	$\gamma\eta(1405)$			DESIG=231
Γ_{133}	$\gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi$	< 9 \times 10 ⁻⁵	CL=90%	DESIG=62
Γ_{134}	$\gamma\eta(1405) \rightarrow \eta\pi^+\pi^-$	(3.6 \pm 2.5) \times 10 ⁻⁵		DESIG=232
Γ_{135}	$\gamma\eta(1475)$			DESIG=233
Γ_{136}	$\gamma\eta(1475) \rightarrow K\bar{K}\pi$	< 1.4 \times 10 ⁻⁴	CL=90%	DESIG=234
Γ_{137}	$\gamma\eta(1475) \rightarrow \eta\pi^+\pi^-$	< 8.8 \times 10 ⁻⁵	CL=90%	DESIG=235
Γ_{138}	$\gamma 2(\pi^+\pi^-)$	(4.0 \pm 0.6) \times 10 ⁻⁴		DESIG=241
Γ_{139}	$\gamma K^{*0}K^+\pi^- + \text{c.c.}$	(3.7 \pm 0.9) \times 10 ⁻⁴		DESIG=242
Γ_{140}	$\gamma K^{*0}\bar{K}^{*0}$	(2.4 \pm 0.7) \times 10 ⁻⁴		DESIG=243
Γ_{141}	$\gamma K_S^0K^+\pi^- + \text{c.c.}$	(2.6 \pm 0.5) \times 10 ⁻⁴		DESIG=244
Γ_{142}	$\gamma K^+K^-\pi^+\pi^-$	(1.9 \pm 0.5) \times 10 ⁻⁴		DESIG=245
Γ_{143}	$\gamma p\bar{p}$	(3.9 \pm 0.5) \times 10 ⁻⁵	S=2.0	DESIG=246
Γ_{144}	$\gamma f_2(1950) \rightarrow \gamma p\bar{p}$	(1.20 \pm 0.22) \times 10 ⁻⁵		DESIG=257
Γ_{145}	$\gamma f_2(2150) \rightarrow \gamma p\bar{p}$	(7.2 \pm 1.8) \times 10 ⁻⁶		DESIG=258
Γ_{146}	$\gamma X(1835) \rightarrow \gamma p\bar{p}$	(4.6 \pm 1.8) \times 10 ⁻⁶		DESIG=259
Γ_{147}	$\gamma X \rightarrow \gamma p\bar{p}$	[a] < 2 \times 10 ⁻⁶	CL=90%	DESIG=260
Γ_{148}	$\gamma\pi^+\pi^-p\bar{p}$	(2.8 \pm 1.4) \times 10 ⁻⁵		DESIG=247
Γ_{149}	$\gamma 2(\pi^+\pi^-)K^+K^-$	< 2.2 \times 10 ⁻⁴	CL=90%	DESIG=248
Γ_{150}	$\gamma 3(\pi^+\pi^-)$	< 1.7 \times 10 ⁻⁴	CL=90%	DESIG=249
Γ_{151}	$\gamma K^+K^-K^+K^-$	< 4 \times 10 ⁻⁵	CL=90%	DESIG=250
Γ_{152}	$\gamma\gamma J/\psi$	(3.1 \pm 1.0) \times 10 ⁻⁴		DESIG=266

[a] For a narrow resonance in the range $2.2 < M(X) < 2.8$ GeV.

LINKAGE=NMR

CONSTRAINED FIT INFORMATION

A multiparticle fit to $\chi_{c1}(1P)$, $\chi_{c0}(1P)$, $\chi_{c2}(1P)$, and $\psi(2S)$ with 4 total widths, a partial width, 25 combinations of partial widths obtained from integrated cross section, and 84 branching ratios uses 227 measurements to determine 49 parameters. The overall fit has a $\chi^2 = 325.4$ for 178 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$.

	x_7	4								
	x_8	1	0							
	x_{11}	39	11	3						
	x_{12}	36	7	2	61					
	x_{13}	21	5	1	47	27				
	x_{19}	2	1	0	7	5	3			
	x_{118}	1	0	0	3	2	1	0		
	x_{119}	2	0	0	4	2	2	0	0	
	x_{120}	2	1	0	5	3	2	0	0	0
Γ	-80	-6	-1	-51	-44	-26	-9	-2	-2	-3
	x_6	x_7	x_8	x_{11}	x_{12}	x_{13}	x_{19}	x_{118}	x_{119}	x_{120}

$\psi(2S)$ PARTIAL WIDTHS

$\Gamma(\text{hadrons})$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT	Γ_1
-------------	-------------	------	---------	------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

258±26	BAI	02B	BES2 $e^+ e^-$	
224±56	LUTH	75	MRK1 $e^+ e^-$	

$\Gamma(e^+ e^-)$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT	Γ_6
-------------	-------------	------	---------	------------

2.37 ±0.04 OUR FIT
[2.35 ± 0.04 keV OUR 2012 FIT]

2.33 ±0.07 OUR AVERAGE

2.338±0.037±0.096	ABLIKIM	08B	BES2 $e^+ e^- \rightarrow \text{hadrons}$	
2.330±0.036±0.110	ABLIKIM	06L	BES2 $e^+ e^- \rightarrow \text{hadrons}$	
2.44 ±0.21	¹ BAI	02B	BES2 $e^+ e^-$	
2.14 ±0.21	ALEXANDER	89	RVUE See γ mini-review	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.0 ±0.3	BRANDELIK	79C	DASP $e^+ e^-$	
2.1 ±0.3	² LUTH	75	MRK1 $e^+ e^-$	

¹ From a simultaneous fit to $e^+ e^-$, $\mu^+ \mu^-$, and hadronic channel, assuming $\Gamma_e = \Gamma_\mu = \Gamma_\tau / 0.38847$.

² From a simultaneous fit to $e^+ e^-$, $\mu^+ \mu^-$, and hadronic channels assuming $\Gamma(e^+ e^-) = \Gamma(\mu^+ \mu^-)$.

$\Gamma(\gamma\gamma)$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{129}
<43	90	BRANDELIK	79C	DASP $e^+ e^-$	

$\psi(2S) \Gamma(i) \Gamma(e^+ e^-) / \Gamma(\text{total})$

This combination of a partial width with the partial width into $e^+ e^-$ and with the total width is obtained from the integrated cross section into channel(i) in the $e^+ e^-$ annihilation. We list only data that have not been used to determine the partial width $\Gamma(i)$ or the branching ratio $\Gamma(i)/\Gamma_{\text{total}}$.

$\Gamma(\text{hadrons}) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT	$\Gamma_1 \Gamma_6 / \Gamma$
-------------	-------------	------	---------	------------------------------

2.233±0.015±0.042

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.2 ±0.4	ABRAMS	75	MRK1 $e^+ e^-$	
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NODE=M071225

NODE=M071W3
NODE=M071W3

NODE=M071W1
NODE=M071W1
NEW

NODE=M071W;LINKAGE=BB

NODE=M071W1;LINKAGE=F

NODE=M071W51
NODE=M071W51

NODE=M071230

NODE=M071230

NODE=M071G3
NODE=M071G3

¹ ANASHIN 12 reports the value $2.233 \pm 0.015 \pm 0.037 \pm 0.020$ keV, where the third uncertainty is due to assumptions on the interference between the resonance and hadronic continuum. We combined the two systematic uncertainties.

$\Gamma(\tau^+\tau^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_8\Gamma_6/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	

• • • We do not use the following data for averages, fits, limits, etc. • • •

9.0 ± 2.6 79 ¹ ANASHIN 07 KEDR $e^+e^- \rightarrow \psi(2S) \rightarrow \tau^+\tau^-$

¹ Using $\psi(2S)$ total width of 337 ± 13 keV. Systematic errors not evaluated.

$\Gamma(J/\psi(1S)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{11}\Gamma_6/\Gamma$
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	

0.807±0.014 OUR FIT

[0.789 ± 0.015 keV OUR 2012 FIT]

0.839±0.025 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.
[0.82 ± 0.04 keV OUR 2012 AVERAGE Scale factor = 1.6]

$0.842 \pm 0.028 \pm 0.009$ ¹ LEES 12E BABR $10.6 e^+e^- \rightarrow 2\pi^+\pi^-\gamma$

$0.852 \pm 0.010 \pm 0.026$ 19.5k ADAM 06 CLEO $3.773 e^+e^- \rightarrow \gamma\psi(2S)$

0.68 ± 0.09 ² BAI 98E BES e^+e^-

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.88 \pm 0.08 \pm 0.03$ 256 ³ AUBERT 07AU BABR $10.6 e^+e^- \rightarrow J/\psi\pi^+\pi^-\gamma$

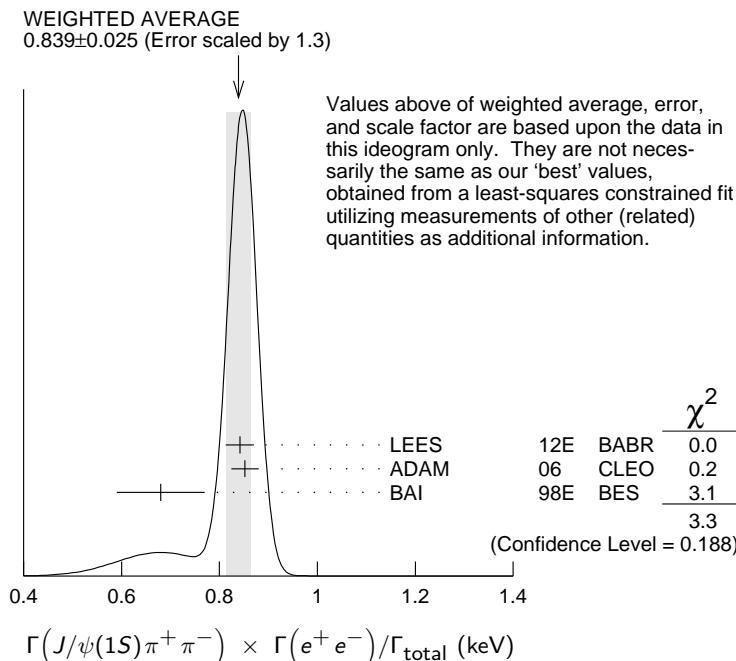
$0.76 \pm 0.05 \pm 0.01$ 544 ⁴ AUBERT 05D BABR $10.6 e^+e^- \rightarrow \pi^+\pi^-\mu^+\mu^-\gamma$

¹ LEES 12E reports [$\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] $\times [B(J/\psi(1S) \rightarrow \mu^+\mu^-)] = (49.9 \pm 1.3 \pm 1.0) \times 10^{-3}$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (5.93 \pm 0.06) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² The value of $\Gamma(e^+e^-)$ quoted in BAI 98E is derived using $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (32.4 \pm 2.6) \times 10^{-2}$ and $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1203 \pm 0.0038$. Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+\ell^-) = 0.1181 \pm 0.0020$.

³ AUBERT 07AU reports [$\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] $\times [B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0)] = 0.0186 \pm 0.0012 \pm 0.0011$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \pi^+\pi^-\pi^0) = (2.11 \pm 0.07) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ AUBERT 05D reports [$\Gamma(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}$] $\times [B(J/\psi(1S) \rightarrow \mu^+\mu^-)] = 0.0450 \pm 0.0018 \pm 0.0022$ keV which we divide by our best value $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (5.93 \pm 0.06) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Superseded by LEES 12E.



NODE=M071G3;LINKAGE=AN

NODE=M071G9
NODE=M071G9

NODE=M071G9;LINKAGE=AN

NODE=M071G1
NODE=M071G1
NEW

NEW

NODE=M071G1;LINKAGE=LE

NODE=M071G1;LINKAGE=AA

NODE=M071G1;LINKAGE=UB

NODE=M071G1;LINKAGE=AU

$\Gamma(J/\psi(1S)\pi^0\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{12}\Gamma_6/\Gamma$
0.425±0.009 OUR FIT [0.417 ± 0.010 keV OUR 2012 FIT]					NODE=M071G6 NODE=M071G6 NEW
0.411±0.008±0.018	3.6k±96	ADAM	06	CLEO	$3.773 e^+ e^- \rightarrow \gamma\psi(2S)$

 $\Gamma(J/\psi(1S)\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{13}\Gamma_6/\Gamma$
79.0±1.7 OUR FIT [77.0 ± 1.9 eV OUR 2012 FIT]					NODE=M071G7 NODE=M071G7 NEW

87 ± 9 OUR AVERAGE

83 ± 25 ± 5	14	¹ AUBERT	07AU	BABR	$10.6 e^+ e^- \rightarrow J/\psi\pi^+\pi^-\pi^0\gamma$
88 ± 6 ± 7	291 ± 24	ADAM	06	CLEO	$3.773 e^+ e^- \rightarrow \gamma\psi(2S)$

¹AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow J/\psi\eta) \cdot B(J/\psi \rightarrow \mu^+\mu^-) \cdot B(\eta \rightarrow \pi^+\pi^-\pi^0) = 1.11 \pm 0.33 \pm 0.07$ eV.

 $\Gamma(J/\psi(1S)\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{14}\Gamma_6/\Gamma$
<8	90	<37	ADAM	06	CLEO	$3.773 e^+ e^- \rightarrow \gamma\psi(2S)$

 $\Gamma(p\bar{p}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{19}\Gamma_6/\Gamma$
0.653±0.028 OUR FIT [0.647 ± 0.028 eV OUR 2012 FIT]					NODE=M071G2 NODE=M071G2 NEW

0.59 ± 0.05 OUR AVERAGE

0.579±0.038±0.036	2.7k	ANDREOTTI	07	E835	$p\bar{p} \rightarrow e^+e^-, J/\psi X$
0.70 ± 0.17 ± 0.03	22	AUBERT	06B		$e^+e^- \rightarrow p\bar{p}\gamma$

 $\Gamma(\Lambda\bar{\Lambda}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{26}\Gamma_6/\Gamma$
1.5±0.4±0.1		AUBERT	07BD	BABR	$10.6 e^+e^- \rightarrow \Lambda\bar{\Lambda}\gamma$

 $\Gamma(2(\pi^+\pi^-\pi^0)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{53}\Gamma_6/\Gamma$
11.2±3.3±1.3	43	AUBERT	06D	BABR	$10.6 e^+e^- \rightarrow 2(\pi^+\pi^-\pi^0)\gamma$

 $\Gamma(K^+K^-2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{67}\Gamma_6/\Gamma$
4.4±2.1±0.3	26	AUBERT	06D	BABR	$10.6 e^+e^- \rightarrow K^+K^-2(\pi^+\pi^-)\gamma$

 $\Gamma(\pi^+\pi^-K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{62}\Gamma_6/\Gamma$
2.56±0.42±0.16	85	AUBERT	07AK	BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

 $\Gamma(\phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{96}\Gamma_6/\Gamma$
0.347±0.169±0.003	6 ± 3	¹ AUBERT	07AK	BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$

¹AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)] \times [B(\phi(1020) \rightarrow K^+K^-)] = 0.17 \pm 0.08 \pm 0.02$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{95}\Gamma_6/\Gamma$
0.57±0.23±0.01	10	¹ AUBERT,BE	06D	BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$

¹AUBERT,BE 06D reports $[\Gamma(\psi(2S) \rightarrow \phi\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)] \times [B(\phi(1020) \rightarrow K^+K^-)] = 0.28 \pm 0.11 \pm 0.02$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = (48.9 \pm 0.5) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2(\pi^+\pi^-)\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{17}\Gamma_6/\Gamma$
29.7±2.2±1.8	410	AUBERT	07AU	BABR	$10.6 e^+e^- \rightarrow 2(\pi^+\pi^-)\pi^0\gamma$

NODE=M071G6

NODE=M071G6

NEW

NODE=M071G7;LINKAGE=UB

NODE=M071G8
NODE=M071G8NODE=M071G11
NODE=M071G11NODE=M071G4
NODE=M071G4NODE=M071G5
NODE=M071G5NODE=M071G12
NODE=M071G12NODE=M071G13
NODE=M071G13

NODE=M071G13;LINKAGE=AU

NODE=M071G10
NODE=M071G10

NODE=M071G10;LINKAGE=AU

NODE=M071G01
NODE=M071G01

$\Gamma(\omega\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{58}\Gamma_6/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
3.01±0.84±0.02	37	1 AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$	
1 AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow \omega\pi^+\pi^-) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow \pi^+\pi^-\pi^0)] = 2.69 \pm 0.73 \pm 0.16$ eV which we divide by our best value $B(\omega(782) \rightarrow \pi^+\pi^-\pi^0) = (89.2 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(2(\pi^+\pi^-)\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{56}\Gamma_6/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
2.87±1.41±0.01	16	1 AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow 2(\pi^+\pi^-)\eta\gamma$	
1 AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow 2(\pi^+\pi^-)\eta) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 1.13 \pm 0.55 \pm 0.08$ eV which we divide by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
$\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{74}\Gamma_6/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
4.4±1.3±0.3	32	AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^+\pi^-\pi^0\gamma$	
$\Gamma(K^+K^-\pi^+\pi^-\eta) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_{65}\Gamma_6/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	
3.0 ±1.8 OUR AVERAGE	[3.1 ± 1.8 eV OUR 2012 AVERAGE]				
3.04±1.79±0.02	7	1 AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^+\pi^-\eta\gamma$	
1 AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\eta) \times \Gamma(\psi(2S) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\eta \rightarrow 2\gamma)] = 1.2 \pm 0.7 \pm 0.1$ eV which we divide by our best value $B(\eta \rightarrow 2\gamma) = (39.41 \pm 0.20) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\psi(2S)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE	DOCUMENT ID	TECN	COMMENT		
0.9785±0.0013 OUR AVERAGE					
0.9779±0.0015	1 BAI	02B	BES2 e^+e^-		
0.981 ± 0.003	1 LUTH	75	MRK1 e^+e^-		
1 Includes cascade decay into $J/\psi(1S)$.					
$\Gamma(\text{virtual}\gamma \rightarrow \text{hadrons})/\Gamma_{\text{total}}$					Γ_2/Γ
VALUE	DOCUMENT ID	TECN	COMMENT		
0.0173±0.0014 OUR AVERAGE	Error includes scale factor of 1.5.				
0.0166±0.0010	1,2 SETH	04	RVUE e^+e^-		
0.0199±0.0019	1 BAI	02B	BES2 e^+e^-		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.029 ± 0.004	1 LUTH	75	MRK1 e^+e^-		
1 Included in $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$.					
2 Using $B(\psi(2S) \rightarrow \ell^+\ell^-) = (0.73 \pm 0.04)\%$ from RPP-2002 and $R = 2.28 \pm 0.04$ determined by a fit to data from BAI 00 and BAI 02C.					

$\Gamma(ggg)/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
10.58±1.62	2.9 M	1 LIBBY	09	CLEO $\psi(2S) \rightarrow \text{hadrons}$	
1 Calculated using $\Gamma(\gamma gg)/\Gamma(ggg) = 0.097 \pm 0.026 \pm 0.016$ from LIBBY 09, $B(\psi(2S) \rightarrow X J/\psi)$ relative and absolute branching fractions from MENDEZ 08, $B(\psi(2S) \rightarrow \gamma\eta_c)$ from MITCHELL 09, and $B(\psi(2S) \rightarrow \text{virtual } \gamma \rightarrow \text{hadrons})$, $B(\psi(2S) \rightarrow \gamma\chi_{cJ})$, and $B(\psi(2S) \rightarrow \ell^+\ell^-)$ from PDG 08. The statistical error is negligible and the systematic error is largely uncorrelated with that of $\Gamma(\gamma gg)/\Gamma_{\text{total}}$ LIBBY 09 measurement.					

$\Gamma(\gamma gg)/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.025±0.288	200 k	1 LIBBY	09	CLEO $\psi(2S) \rightarrow \gamma + \text{hadrons}$	
1 Calculated using $\Gamma(\gamma gg)/\Gamma(ggg) = 0.097 \pm 0.026 \pm 0.016$ from LIBBY 09. The statistical error is negligible and the systematic error is largely uncorrelated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ LIBBY 09 measurement.					

NODE=M071G02

NODE=M071G02

NODE=M071G02;LINKAGE=UB

NODE=M071G03

NODE=M071G03

NODE=M071G03;LINKAGE=UB

NODE=M071G04

NODE=M071G04

NODE=M071G05

NODE=M071G05

NEW

NODE=M071G05;LINKAGE=UB

NODE=M071235

NODE=M071R3

NODE=M071R3

NODE=M071R;LINKAGE=P

NODE=M071R5

NODE=M071R5

NODE=M071R;LINKAGE=Z

NODE=M071R5;LINKAGE=SE

NODE=M071S43

NODE=M071S43

NODE=M071S43;LINKAGE=LI

NODE=M071S44

NODE=M071S44

NODE=M071S44;LINKAGE=LI

$\Gamma(\gamma gg)/\Gamma(ggg)$

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ_3
$9.7 \pm 2.6 \pm 1.6$	2.9 M	LIBBY	09	CLEO $\psi(2S) \rightarrow (\gamma +)$ hadrons	NODE=M071S45 NODE=M071S45

 $\Gamma(\text{light hadrons})/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_5/Γ
0.154 ± 0.015	1 MENDEZ	08	CLEO $e^+ e^- \rightarrow \psi(2S)$	NODE=M071S27 NODE=M071S27
• • • We do not use the following data for averages, fits, limits, etc. • • •				

0.169 \pm 0.026 2 ADAM 05A CLEO $e^+ e^- \rightarrow \psi(2S)$ ¹ Uses $B(\psi(2S) \rightarrow J/\psi X)$ from MENDEZ 08 and other branching fractions from PDG 07.² Uses $B(J/\psi X)$ from ADAM 05A, $B(\chi_c J/\psi)$, $B(\eta_c \gamma)$ from ATHAR 04 and $B(\ell^+ \ell^-)$ from PDG 04. Superseded by MENDEZ 08. $\Gamma(e^+ e^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_6/Γ
78.2 ± 1.7 OUR FIT				NODE=M071R1 NODE=M071R1

[(77.3 ± 1.7) $\times 10^{-4}$ OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

88 \pm 13 1 FELDMAN 77 RVUE $e^+ e^-$ ¹ From an overall fit assuming equal partial widths for $e^+ e^-$ and $\mu^+ \mu^-$. For a measurement of the ratio see the entry $\Gamma(\mu^+ \mu^-)/\Gamma(e^+ e^-)$ below. Includes LUTH 75, HILGER 75, BURMESTER 77. $\Gamma(\mu^+ \mu^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ
78 ± 9 OUR FIT				NODE=M071R2 NODE=M071R2

[(77 ± 8) $\times 10^{-4}$ OUR 2012 FIT] $\Gamma(\mu^+ \mu^-)/\Gamma(e^+ e^-)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ_6
1.00 ± 0.11 OUR FIT				NODE=M071R4 NODE=M071R4

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.89 \pm 0.16 BOYARSKI 75C MRK1 $e^+ e^-$ $\Gamma(\tau^+ \tau^-)/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_8/Γ
31 ± 4 OUR FIT				NODE=M071R75 NODE=M071R75

[(30 ± 4) $\times 10^{-4}$ OUR 2012 FIT]30.8 \pm 2.1 \pm 3.8 1 ABLIKIM 06W BES $e^+ e^- \rightarrow \psi(2S)$ ¹ Computed using PDG 02 value of $B(\psi(2S) \rightarrow \text{hadrons}) = 0.9810 \pm 0.0030$ to estimate the total number of $\psi(2S)$ events.**DECAYS INTO $J/\psi(1S)$ AND ANYTHING** $\Gamma(J/\psi(1S)\text{anything})/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_9/Γ
0.603 ± 0.007 OUR FIT					NODE=M071305

[0.595 ± 0.008 OUR 2012 FIT] **0.55 ± 0.07 OUR AVERAGE**0.51 \pm 0.12 BRANDELIK 79C DASP $e^+ e^- \rightarrow \mu^+ \mu^- X$
0.57 \pm 0.08 ABRAMS 75B MRK1 $e^+ e^- \rightarrow \mu^+ \mu^- X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.6254 \pm 0.0016 \pm 0.0155 1.1M 1 MENDEZ 08 CLEO $\psi(2S) \rightarrow \ell^+ \ell^- X$
0.5950 \pm 0.0015 \pm 0.0190 151k ADAM 05A CLEO Repl. by MENDEZ 08¹ Not independent from other measurements of MENDEZ 08. $\Gamma(e^+ e^-)/\Gamma(J/\psi(1S)\text{anything})$

$$\Gamma_6/\Gamma_9 = \Gamma_6/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})$$

<u>VALUE</u> (units 10^{-2})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_9/Γ
1.298 ± 0.026 OUR FIT					NODE=M071R10 NODE=M071R10

[(1.299 ± 0.026) $\times 10^{-2}$ OUR 2012 FIT] **1.28 ± 0.04 OUR AVERAGE** Error includes scale factor of 1.6. See the ideogram below.1.22 \pm 0.02 \pm 0.05 5097 \pm 73 1 ANDREOTTI 05 E835 $p\bar{p} \rightarrow \psi(2S) \rightarrow e^+ e^-$
1.28 \pm 0.03 \pm 0.02 1 AMBROGIANI 00A E835 $p\bar{p} \rightarrow \psi(2S)$
1.44 \pm 0.08 \pm 0.02 1 ARMSTRONG 97 E760 $\bar{p}p \rightarrow \psi(2S)$

NODE=M071R10;LINKAGE=ME

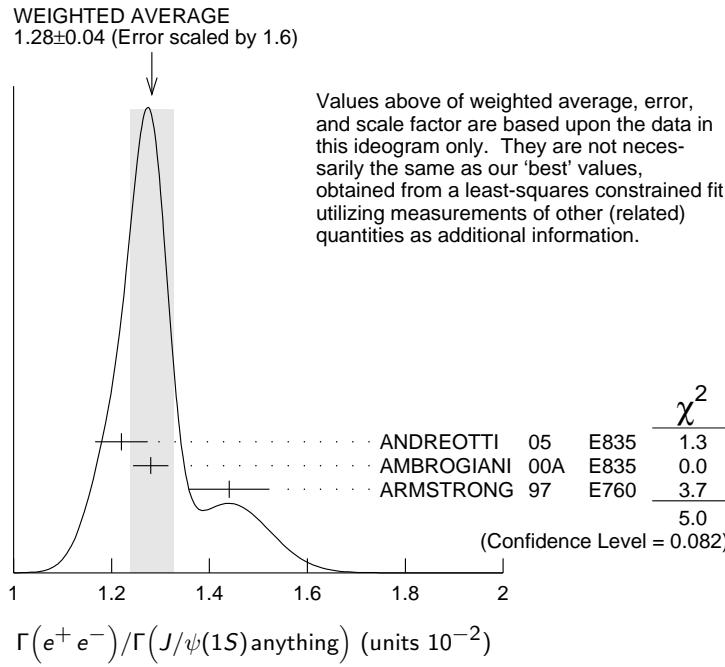
NODE=M071R72

NODE=M071R72

NEW

¹ Using $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0593 \pm 0.0010$.

NODE=M071R;LINKAGE=7A



$\Gamma(\mu^+ \mu^-)/\Gamma(J/\psi(1S)\text{anything})$

$$\Gamma_7/\Gamma_9 = \Gamma_7/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})$$

VALUE	DOCUMENT ID	TECN	COMMENT
0.0130±0.0014 OUR FIT			
0.014 ± 0.003	HILGER	75	SPEC $e^+ e^-$

NODE=M071R74
NODE=M071R74

$\Gamma(J/\psi(1S)\text{ neutrals})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.249±0.004 OUR FIT [0.246 ± 0.004 OUR 2012 FIT]			

Γ_{10}/Γ

NODE=M071R18
NODE=M071R18
NEW

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.340 ± 0.004 OUR FIT [0.336 ± 0.004 OUR 2012 FIT]				
0.343 ± 0.011 OUR AVERAGE				Error includes scale factor of 1.7.
0.3504±0.0007±0.0077	565k	MENDEZ 08	CLEO $\psi(2S) \rightarrow \ell^+ \ell^- \pi^+ \pi^-$	
0.323 ± 0.014		BAI 02B	BES2 $e^+ e^-$	
0.32 ± 0.04		ABRAMS 75B	MRK1 $e^+ e^- \rightarrow J/\psi \pi^+ \pi^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.3354±0.0014±0.0110	60k	¹ ADAM 05A	CLEO Repl. by MENDEZ 08	

¹ Not independent from other values reported by ADAM 05A.

NODE=M071R12
NODE=M071R12
NEW

$\Gamma(e^+ e^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT
0.0230±0.0005 OUR FIT			
0.0252±0.0028±0.0011	¹ AUBERT 02B	BABR	$e^+ e^-$

NODE=M071R;LINKAGE=AD

NODE=M071R73
NODE=M071R73

¹ Using $B(J/\psi(1S) \rightarrow e^+ e^-) = 0.0593 \pm 0.0010$.

$\Gamma(\mu^+ \mu^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT
0.0229±0.0025 OUR FIT			
0.0224±0.0029 OUR AVERAGE			
0.0216±0.0026±0.0014	¹ AUBERT 02B	BABR	$e^+ e^-$
0.0327±0.0077±0.0072	¹ GRIBUSHIN 96	FMPS 515	$\pi^- \text{Be} \rightarrow 2\mu X$

NODE=M071R73;LINKAGE=7A

NODE=M071R63
NODE=M071R63

¹ Using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$.

NODE=M071R;LINKAGE=Q2

$\Gamma(\tau^+\tau^-)/\Gamma(J/\psi(1S)\pi^+\pi^-)$

VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
9.0 ± 1.1 OUR FIT			
8.73±1.39±1.57	BAI 02	BES	$e^+ e^-$

NODE=M071R76
NODE=M071R76

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\text{anything})$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.5648±0.0026 OUR FIT

[0.5646 ± 0.0026 OUR 2012 FIT]

0.554 ± 0.008 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

0.5604 ± 0.0009 ± 0.0062	565k	MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \pi^+ \pi^-$
0.525 ± 0.009 ± 0.022	4k	ANDREOTTI	05	E835	$\psi(2S) \rightarrow J/\psi X$
0.536 ± 0.007 ± 0.016	20k	1,2 ABLIKIM	04B	BES	$\psi(2S) \rightarrow J/\psi X$
0.496 ± 0.037		ARMSTRONG	97	E760	$\bar{p}p \rightarrow \psi(2S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.5637 ± 0.0027 ± 0.0046	60k	ADAM	05A	CLEO	Repl. by MENDEZ 08
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1 From a fit to the J/ψ recoil mass spectra.

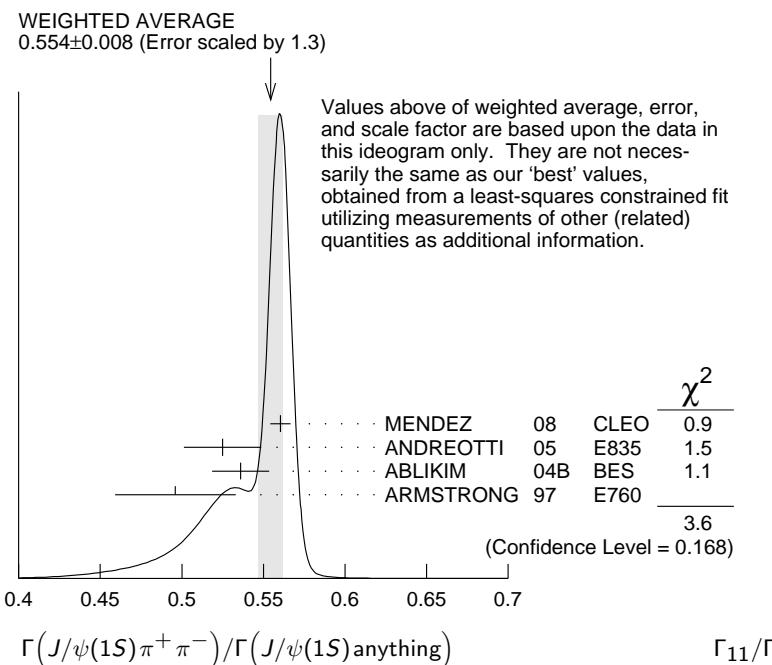
2 ABLIKIM 04B quotes $B(\psi(2S) \rightarrow J/\psi X) / B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-)$.

 Γ_{11}/Γ_9

NODE=M071R70

NODE=M071R70

NEW



$$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma(J/\psi(1S)\text{anything}) \quad \Gamma_{11}/\Gamma_9$$

 $\Gamma(J/\psi(1S)\text{ neutrals})/\Gamma(J/\psi(1S)\pi^+\pi^-)$

$$\Gamma_{10}/\Gamma_{11} = (0.9761\Gamma_{12} + 0.719\Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})/\Gamma_{11}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.730±0.008 OUR FIT

[0.731 ± 0.008 OUR 2012 FIT]

0.73 ± 0.09 TANENBAUM 76 MRK1 $e^+ e^-$

NODE=M071R11

NODE=M071R11

NEW

 $\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.1793±0.0033 OUR FIT

[0.1775 ± 0.0034 OUR 2012 FIT]

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.1769 ± 0.0008 ± 0.0053	61k	1 MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- 2\pi^0$
0.1652 ± 0.0014 ± 0.0058	13.4k	2 ADAM	05A	CLEO	Repl. by MENDEZ 08

1 Not independent from other measurements of MENDEZ 08.

2 Not independent from other values reported by ADAM 05A.

NODE=M071R17

NODE=M071R17

NEW

NODE=M071R17;LINKAGE=ME

NODE=M071R17;LINKAGE=AD

 $\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\text{anything})$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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0.2975±0.0031 OUR FIT

[0.2982 ± 0.0032 OUR 2012 FIT]

0.320 ± 0.012 OUR AVERAGE

0.300 ± 0.008 ± 0.022	1655 ± 44	ANDREOTTI 05	E835	$\psi(2S) \rightarrow J/\psi X$
0.328 ± 0.013 ± 0.008		AMBROGIANI 00A	E835	$p\bar{p} \rightarrow \psi(2S)$
0.323 ± 0.033		ARMSTRONG 97	E760	$\bar{p}p \rightarrow \psi(2S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.2829 ± 0.0012 ± 0.0056	61k	MENDEZ	08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- 2\pi^0$
0.2776 ± 0.0025 ± 0.0043	13.4k	ADAM	05A	CLEO	Repl. by MENDEZ 08

 Γ_{12}/Γ_9

NODE=M071R69

NODE=M071R69

NEW

$\Gamma(J/\psi(1S)\pi^0\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ_{11}
0.527 ± 0.008 OUR FIT [0.528 ± 0.008 OUR 2012 FIT]					NODE=M071R14 NODE=M071R14 NEW
0.513 ± 0.022 OUR AVERAGE				Error includes scale factor of 2.2.	
0.5047 ± 0.0022 ± 0.0102	61k	MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- 2\pi^0$	
0.570 ± 0.009 ± 0.026	14k	1 ABLIKIM 04B	BES	$\psi(2S) \rightarrow J/\psi X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.4924 ± 0.0047 ± 0.0086	73k	2,3 ADAM 05A	CLEO	Repl. by MENDEZ 08	
0.571 ± 0.018 ± 0.044		4 ANDREOTTI 05	E835	$\psi(2S) \rightarrow J/\psi X$	
0.53 ± 0.06		TANENBAUM 76	MRK1	$e^+ e^-$	
0.64 ± 0.15		5 HILGER 75	SPEC	$e^+ e^-$	

1 From a fit to the J/ψ recoil mass spectra.

2 Not independent from other values reported by ADAM 05A.

3 Using 13,217 $J/\psi\pi^0\pi^0$ and 60,010 $J/\psi\pi^+\pi^-$ events.

4 Not independent from other values reported by ANDREOTTI 05.

5 Ignoring the $J/\psi(1S)\eta$ and $J/\psi(1S)\gamma\gamma$ decays.
 $\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
33.3 ± 0.5 OUR FIT [0.0328 ± 0.0007 OUR 2012 FIT]					NODE=M071R15 NODE=M071R15 NEW
32.9 ± 1.7 OUR AVERAGE				Error includes scale factor of 2.1. See the ideogram below. [0.0296 ± 0.0031 OUR 2012 AVERAGE Scale factor = 1.8]	NEW
33.75 ± 0.17 ± 0.86	68.2k	ABLIKIM 12M	BES3	$e^+ e^- \rightarrow \ell^+ \ell^- 2\gamma$	
29.8 ± 0.9 ± 2.3	5.7k	BAI 04I	BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$	
25.5 ± 2.9	386	1 OREGLIA 80	CBAL	$e^+ e^- \rightarrow J/\psi 2\gamma$	
45 ± 12	17	2 BRANDELIK 79B	DASP	$e^+ e^- \rightarrow J/\psi 2\gamma$	
42 ± 6	164	2 BARTEL 78B	CNTR	$e^+ e^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
34.3 ± 0.4 ± 0.9	18.4k	3 MENDEZ 08	CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \eta$	
32.5 ± 0.6 ± 1.1	2.8k	4 ADAM 05A	CLEO	Repl. by MENDEZ 08	
43 ± 8	44	TANENBAUM 76	MRK1	$e^+ e^-$	

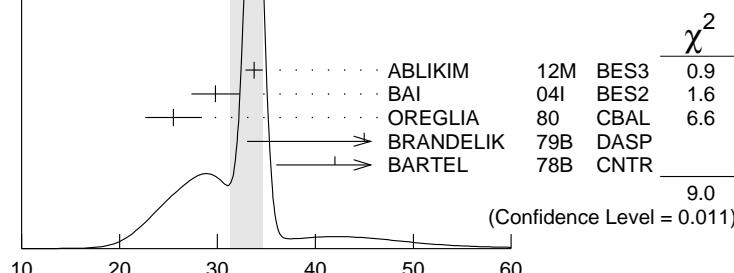
1 Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.2 Recalculated by us using $B(J/\psi(1S) \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$.

3 Not independent from other measurements of MENDEZ 08.

4 Not independent from other values reported by ADAM 05A.

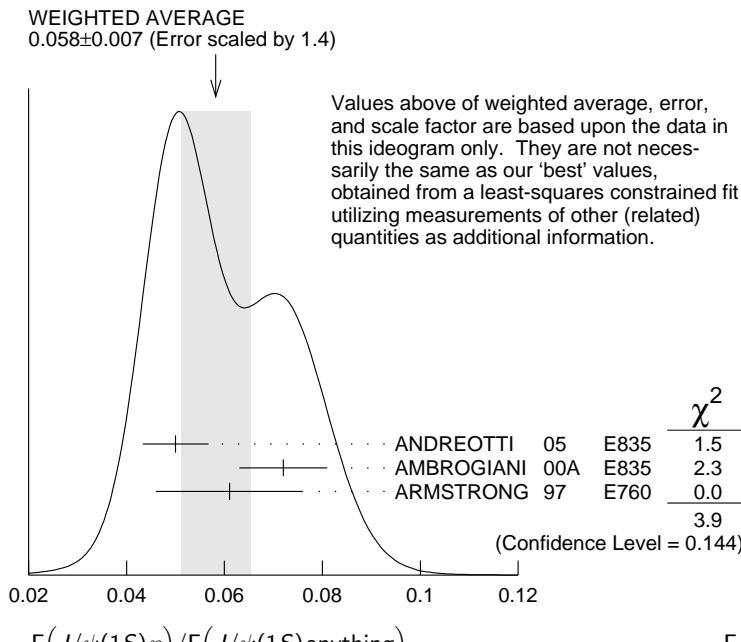
WEIGHTED AVERAGE
32.9±1.7 (Error scaled by 2.1)

Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.


 $\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}} (\text{units } 10^{-3})$

$\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{13}/Γ_9

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0553 ± 0.0008 OUR FIT [0.0551 ± 0.0009 OUR 2012 FIT]				
0.058 ± 0.007 OUR AVERAGE				Error includes scale factor of 1.4. See the ideogram below.
0.050 ± 0.006 ± 0.003	298 ± 20	ANDREOTTI 05 E835	$\psi(2S) \rightarrow J/\psi X$	
0.072 ± 0.009		AMBROGIANI 00A E835	$p\bar{p} \rightarrow \psi(2S)$	
0.061 ± 0.015		ARMSTRONG 97 E760	$\bar{p}p \rightarrow \psi(2S)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0549 ± 0.0006 ± 0.0009	18.4k	¹ MENDEZ 08 CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \eta$	
0.0546 ± 0.0010 ± 0.0007	2.8k	ADAM 05A CLEO	Repl. by MENDEZ 08	

¹ Not independent from other measurements of MENDEZ 08. $\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\text{anything})$ Γ_{13}/Γ_9 $\Gamma(J/\psi(1S)\eta)/\Gamma(J/\psi(1S)\pi^+\pi^-)$ Γ_{13}/Γ_{11}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.0979 ± 0.0014 OUR FIT [0.0976 ± 0.0016 OUR 2012 FIT]				
0.0979 ± 0.0018 OUR AVERAGE				
0.0979 ± 0.0010 ± 0.0015	18.4k	MENDEZ 08 CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- \eta$	
0.098 ± 0.005 ± 0.010	2k	¹ ABLIKIM 04B BES	$\psi(2S) \rightarrow J/\psi X$	
0.091 ± 0.021		2 HIMEL 80 MRK2	$e^+ e^- \rightarrow \psi(2S)X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0968 ± 0.0019 ± 0.0013	2.8k	³ ADAM 05A CLEO	Repl. by MENDEZ 08	
0.095 ± 0.007 ± 0.007		⁴ ANDREOTTI 05 E835	$\psi(2S) \rightarrow J/\psi X$	

1 From a fit to the J/ψ recoil mass spectra.2 The value for $B(\psi(2S) \rightarrow J/\psi(1S)\eta)$ reported in HIMEL 80 is derived using $B(\psi(2S)) \rightarrow J/\psi(1S)\pi^+\pi^- = (33 \pm 3)\%$ and $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.138 \pm 0.018$. Calculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = (0.1181 \pm 0.0020)$.

3 Not independent from other values reported by ADAM 05A.

4 Not independent from other values reported by ANDREOTTI 05.

NODE=M071R71

NODE=M071R71

NEW

 $\Gamma(J/\psi(1S)\pi^0)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
12.68 ± 0.32 OUR AVERAGE				
$[(13.0 \pm 1.0) \times 10^{-4}$ OUR 2012 AVERAGE Scale factor = 1.4]				
12.6 ± 0.2 ± 0.3	4.1k	ABLIKIM 12M BES3	$e^+ e^- \rightarrow \ell^+ \ell^- 2\gamma$	
13.3 ± 0.8 ± 0.3	530	MENDEZ 08 CLEO	$\psi(2S) \rightarrow \ell^+ \ell^- 2\gamma$	
14.3 ± 1.4 ± 1.2	280	BAI 04I BES2	$\psi(2S) \rightarrow J/\psi\gamma\gamma$	
14 ± 6	7	HIMEL 80 MRK2	$e^+ e^-$	
9 ± 2 ± 1	23	¹ OREGLIA 80 CBAL	$\psi(2S) \rightarrow J/\psi 2\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
13 ± 1 ± 1	88	ADAM 05A CLEO	Repl. by MENDEZ 08	

¹ Recalculated by us using $B(J/\psi(1S) \rightarrow \ell^+ \ell^-) = 0.1181 \pm 0.0020$.

NODE=M071R71;LINKAGE=AB

NODE=M071R;LINKAGE=8H

NODE=M071R71;LINKAGE=AD

NODE=M071R71;LINKAGE=AN

NODE=M071R16

NODE=M071R16

NEW

NODE=M071R16;LINKAGE=3Q

$\Gamma(J/\psi(1S)\pi^0)/\Gamma(J/\psi(1S)\text{anything})$

$$\Gamma_{14}/\Gamma_9 = \Gamma_{14}/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13} + 0.348\Gamma_{119} + 0.198\Gamma_{120})$$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.213 \pm 0.012 \pm 0.003$	527	¹ MENDEZ	08 CLEO	$e^+ e^- \rightarrow J/\psi\gamma\gamma$
$0.22 \pm 0.02 \pm 0.01$		² ADAM	05A CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow J/\psi\gamma\gamma$

¹ Not independent from other values reported by MENDEZ 08. Supersedes ADAM 05A.² Not independent from other values reported by ADAM 05A. $\Gamma(J/\psi(1S)\pi^0)/\Gamma(J/\psi(1S)\pi^+\pi^-)$

$$\Gamma_{14}/\Gamma_{11}$$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.380 \pm 0.022 \pm 0.005$	527	¹ MENDEZ	08 CLEO	$e^+ e^- \rightarrow J/\psi\gamma\gamma$
$0.39 \pm 0.04 \pm 0.01$		² ADAM	05A CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow J/\psi\gamma\gamma$

¹ Not independent from other values reported by MENDEZ 08. Supersedes ADAM 05A.² Not independent from other values reported by ADAM 05A.**HADRONIC DECAYS** $\Gamma(\pi^0 h_c(1P))/\Gamma_{\text{total}}$

$$\Gamma_{15}/\Gamma$$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
8.6±1.3 OUR AVERAGE				
$9.0 \pm 1.5 \pm 1.3$	3k	¹ GE	11 CLEO	$\gamma(2S) \rightarrow \pi^0 \text{ anything}$
$8.4 \pm 1.3 \pm 1.0$	11k	ABLIKIM	10B BES3	$\psi(2S) \rightarrow \pi^0 h_c$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	92^{+23}_{-22}	ADAMS	09 CLEO	$\psi(2S) \rightarrow 2\pi^+ 2\pi^- 2\pi^0$
seen	1282	DOBBS	08A CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$
seen	168 ± 40	ROSNER	05 CLEO	$\psi(2S) \rightarrow \pi^0 \eta_c \gamma$

¹ Assuming a width $\Gamma(h_c(1P)) = 0.86$ MeV $\equiv \Gamma_0$, a measured dependence of the central value of $B = (7.6 + 1.4 \times \Gamma(h_c(1P)/\Gamma_0) \times 10^{-4}$, and with a systematic error that accounts for the width variation range 0.43–1.29 MeV.

 $\Gamma(3(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$

$$\Gamma_{16}/\Gamma$$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
35±16	6	FRANKLIN	83 MRK2	$e^+ e^- \rightarrow \text{hadrons}$

 $\Gamma(2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}$

$$\Gamma_{17}/\Gamma$$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
29 ± 10 OUR AVERAGE				
Error includes scale factor of 4.6. See the ideogram below.				
$24.9 \pm 0.7 \pm 3.6$	2173	ABLIKIM	07D BES2	$e^+ e^- \rightarrow \psi(2S)$
$125 \pm 12 \pm 2$	410	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow 2(\pi^+\pi^-)\pi^0 \gamma$
$26.1 \pm 0.7 \pm 3.0$	1703	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$

¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (297 \pm 22 \pm 18) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M071S25

NODE=M071S25

NODE=M071S25;LINKAGE=ME
NODE=M071S25;LINKAGE=ADNODE=M071S26
NODE=M071S26NODE=M071S26;LINKAGE=ME
NODE=M071S26;LINKAGE=AD

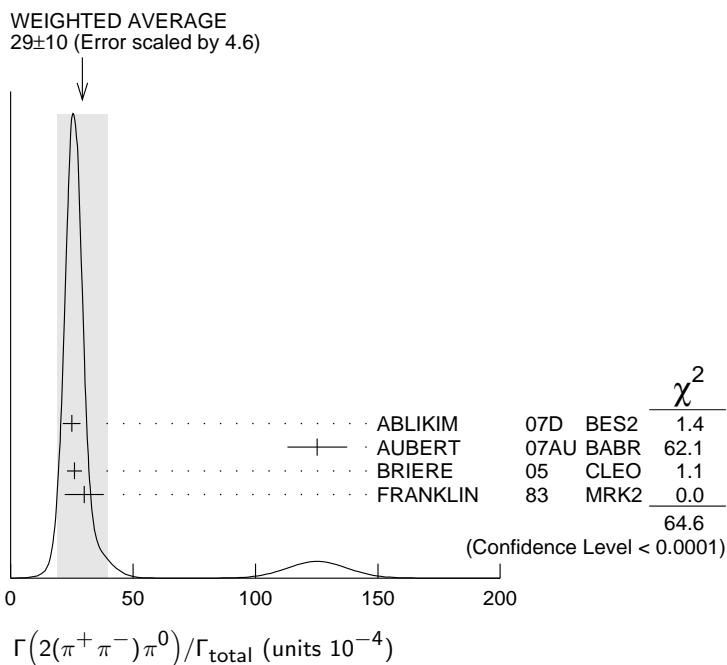
NODE=M071310

NODE=M071S42
NODE=M071S42

NODE=M071S42;LINKAGE=GE

NODE=M071R37
NODE=M071R37NODE=M071R22
NODE=M071R22

NODE=M071R22;LINKAGE=UB

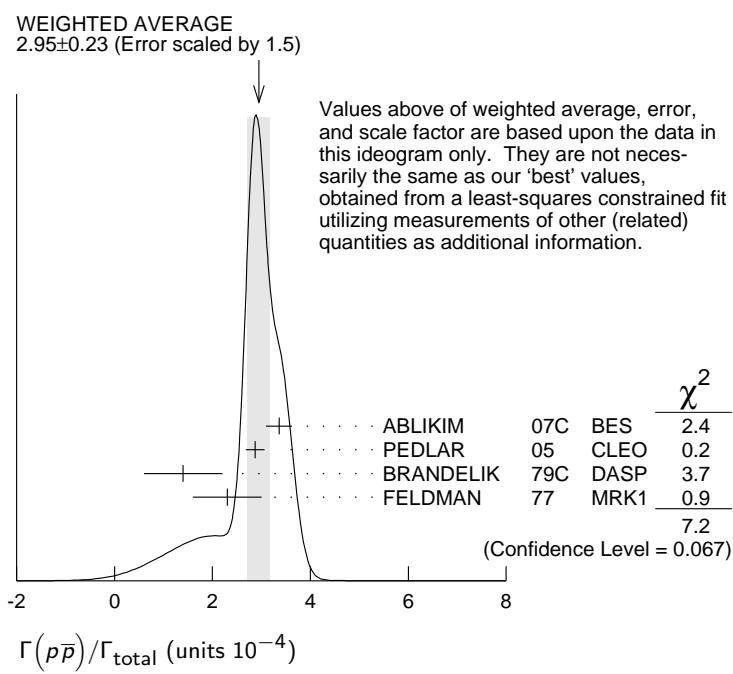


$\Gamma(\rho a_2(1320))/\Gamma_{\text{total}}$	Γ_{18}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>
$2.55 \pm 0.73 \pm 0.47$	112 ± 31
BAI	04C BES2
	$\psi(2S) \rightarrow 2(\pi^+ \pi^-) \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<2.3	90
BAI	98J BES
	$e^+ e^-$

NODE=M071R65
NODE=M071R65

$\Gamma(p\bar{p})/\Gamma_{\text{total}}$	Γ_{19}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>
2.75 ± 0.12 OUR FIT	<u>DOCUMENT ID</u>
$[(2.76 \pm 0.12) \times 10^{-4}$ OUR 2012 FIT]	<u>TECN</u>
2.95 ± 0.23 OUR AVERAGE	<u>COMMENT</u>
3.36 ± 0.09 ± 0.25	1618 ABLIKIM 07C BES $e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
2.87 ± 0.12 ± 0.15	557 PEDLAR 05 CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
1.4 ± 0.8	4 BRANDELIK 79C DASP $e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$
2.3 ± 0.7	FELDMAN 77 MRK1 $e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}$

NODE=M071R25
NODE=M071R25
NEW



$\Gamma(p\bar{p})/\Gamma(J/\psi(1S)\pi^+\pi^-)$ VALUE (units 10^{-4})**8.09±0.35 OUR FIT**[(8.2 ± 0.4) $\times 10^{-4}$ OUR 2012 FIT]**6.98±0.49±0.97**

DOCUMENT ID

TECN

COMMENT

 Γ_{19}/Γ_{11}

NODE=M071S40

NODE=M071S40

NEW

 $\Gamma(\Delta^{++}\bar{\Delta}^{--})/\Gamma_{\text{total}}$ VALUE (units 10^{-5})**12.8±1.0±3.4**

EVTS

DOCUMENT ID

TECN

COMMENT

 Γ_{20}/Γ

NODE=M071R50

NODE=M071R50

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.310 \pm 0.028$. $\Gamma(\Lambda\bar{\Lambda}\pi^0)/\Gamma_{\text{total}}$ VALUE (units 10^{-5})**< 0.29 (CL = 90%)**[$< 1.2 \times 10^{-4}$ (CL = 90%) OUR 2012 BEST LIMIT]**< 0.29**

90

• • • We do not use the following data for averages, fits, limits, etc. • • •

<12

90

• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\pi^0 \rightarrow \gamma\gamma) = 98.8\%$.• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\eta \rightarrow \gamma\gamma) = 39.4\%$. Γ_{21}/Γ

NODE=M071R6

NODE=M071R6

 $\Gamma(\Lambda\bar{\Lambda}\eta)/\Gamma_{\text{total}}$ VALUE (units 10^{-5})**2.48±0.34±0.19**

EVTS

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.9

90

• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\eta \rightarrow \gamma\gamma) = 39.31\%$.• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$. Γ_{22}/Γ

NODE=M071R7

NODE=M071R7

 $\Gamma(\Lambda\bar{p}K^+)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})**1.0±0.1±0.1**

EVTS

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.9

90

• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(K^+ \rightarrow \pi^+\pi^-) = 63.9\%$.• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$. Γ_{23}/Γ

NODE=M071S18

NODE=M071S18

 $\Gamma(\Lambda\bar{p}K^+\pi^+\pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})**1.8±0.3±0.3**

EVTS

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.9

90

• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(K^+\pi^+\pi^-) = 63.9\%$.• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$. Γ_{24}/Γ

NODE=M071S19

NODE=M071S19

 $\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$ VALUE (units 10^{-4})**2.8±0.4±0.5**

EVTS

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4

90

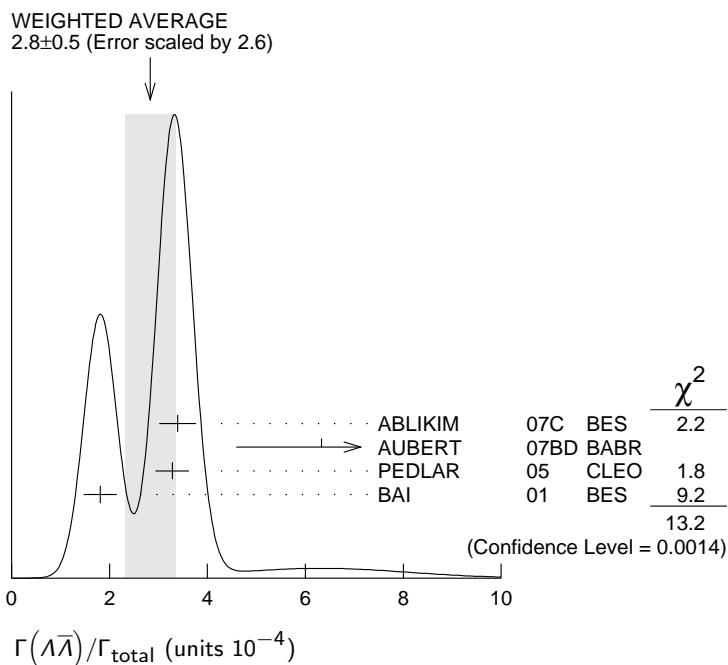
• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$ and $B(\bar{\Lambda} \rightarrow \pi^+\pi^-) = 63.9\%$.• • • Using $B(\Lambda \rightarrow \pi^- p) = 63.9\%$. Γ_{25}/Γ

NODE=M071S17

NODE=M071S17

¹ AUBERT 07BD reports $[\Gamma(\psi(2S) \rightarrow \Lambda\bar{\Lambda})/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (15 \pm 4 \pm 1) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.² Estimated using $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.310 \pm 0.028$. Γ_{26}/Γ

NODE=M071R28



$\Gamma(\Sigma^0 \bar{p} K^+ + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.67 \pm 0.13 \pm 0.12$	276	1 ABLIKIM	13D BES3	$\psi(2S) \rightarrow \gamma \Lambda \bar{p} K^+$

¹ Using $B(\Lambda \rightarrow p\pi^-) = 63.9\%$, and $B(\Sigma^0 \rightarrow \Lambda\gamma) = 100\%$.

Γ_{27}/Γ

NODE=M071S63
NODE=M071S63

$\Gamma(\Sigma^+ \bar{\Sigma}^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$25.7 \pm 4.4 \pm 6.8$	35	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

Γ_{28}/Γ

NODE=M071R47
NODE=M071R47

$\Gamma(\Sigma^0 \bar{\Sigma}^0)/\Gamma_{\text{total}}$

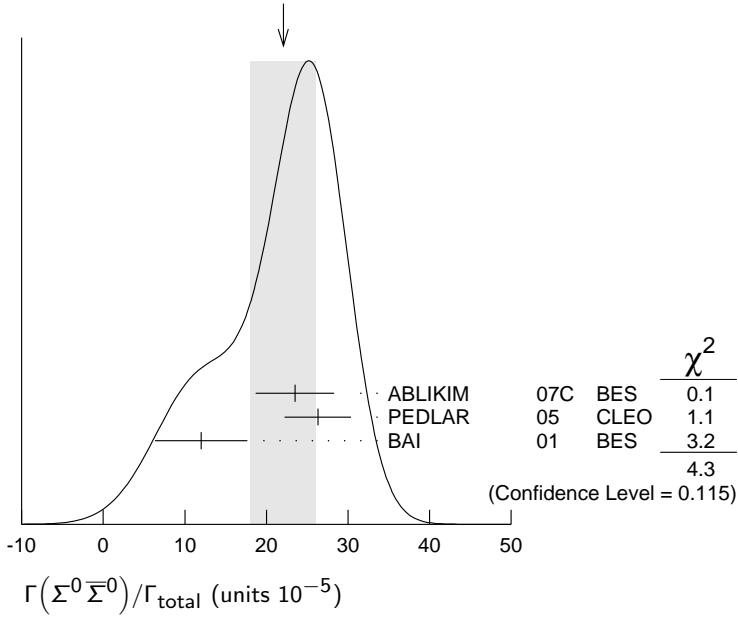
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
22 ± 4 OUR AVERAGE				Error includes scale factor of 1.5. See the ideogram below.
$23.5 \pm 3.6 \pm 3.2$	59	ABLIKIM	07C BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
$26.3 \pm 3.5 \pm 2.1$	58	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$
$12 \pm 4 \pm 4$	8	1 BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

¹ Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

Γ_{29}/Γ

NODE=M071R51
NODE=M071R51

WEIGHTED AVERAGE
22±4 (Error scaled by 1.5)



$\Gamma(\Sigma(1385)^+ \bar{\Sigma}(1385)^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
11±3±3	14	1 BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

1 Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

 Γ_{30}/Γ

NODE=M071R52
NODE=M071R52

 $\Gamma(\Xi^- \bar{\Xi}^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
18 ± 6 OUR AVERAGE					Error includes scale factor of 2.8. See the ideogram below.
30.3±4.0±3.2	67	ABLIKIM	07C BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$	
23.8±3.0±2.1	63	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$	

9.4±2.7±1.5 12 1 BAI 01 BES $e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

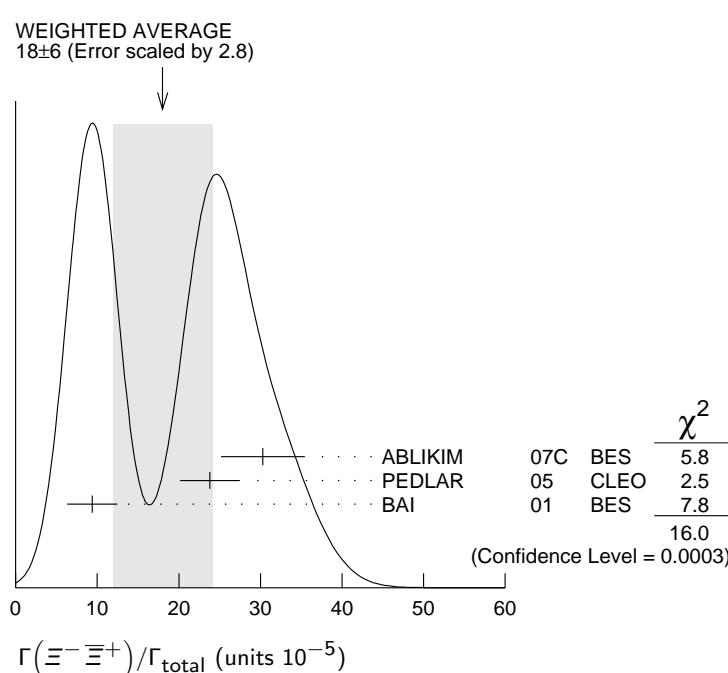
• • • We do not use the following data for averages, fits, limits, etc. • • •

<20 90 FELDMAN 77 MRK1 $e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

1 Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

 Γ_{31}/Γ

NODE=M071R29
NODE=M071R29

 $\Gamma(\Xi^0 \bar{\Xi}^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
27.5±6.4±6.1	19	PEDLAR	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

 Γ_{32}/Γ

NODE=M071R48
NODE=M071R48

 $\Gamma(\Xi(1530)^0 \bar{\Xi}(1530)^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 8.1	90	1 BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<32 90 PEDLAR 05 CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

1 Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

 Γ_{33}/Γ

NODE=M071R53
NODE=M071R53

 $\Gamma(\Omega^- \bar{\Omega}^+)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
< 7.3	90	1 BAI	01 BES	$e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<16 90 PEDLAR 05 CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow \text{hadrons}$

1 Estimated using $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.310 \pm 0.028$.

 Γ_{34}/Γ

NODE=M071R54
NODE=M071R54

NODE=M071R54;LINKAGE=PP

$\Gamma(\pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-4})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{35}/Γ
1.53±0.07 OUR AVERAGE					
$[(1.50 \pm 0.08) \times 10^{-4}$ OUR 2012 AVERAGE Scale factor = 1.1]					
1.65±0.03±0.15	4.5k	ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	
1.54±0.06±0.06	948	ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 p\bar{p}$	
1.32±0.10±0.15	256 ± 18	¹ ABLIKIM	05E BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\gamma\gamma$	
1.4 ± 0.5	9	FRANKLIN	83 MRK2	$e^+ e^- \rightarrow$	

¹ Computed using $B(\pi^0 \rightarrow \gamma\gamma) = (98.80 \pm 0.03)\%$.

 $\Gamma(N(940)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{36}/Γ
6.42±0.20^{+1.78}_{-1.28}	1.9k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

 $\Gamma(N(1440)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{37}/Γ
7.3^{+1.7}_{-1.5} OUR AVERAGE	Error includes scale factor of 2.5. $[(8.1 \pm 0.8) \times 10^{-5}$ OUR 2012 AVERAGE]				

3.58±0.25 ^{+1.59} _{-0.84}	1.1k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$
8.1 ± 0.7 ± 0.3	474	² ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 p\bar{p}$

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

² From a fit of the $p\bar{p}$ and $p\pi^0$ mass distributions to a combination of $N(1440)\bar{p}$, $\pi^0 f_0(2100)$, and two other broad, unestablished resonances.

 $\Gamma(N(1520)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{38}/Γ
0.64±0.05^{+0.22}_{-0.17}	0.2k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

 $\Gamma(N(1535)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{39}/Γ
2.47±0.28^{+0.99}_{-0.97}	0.7k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

 $\Gamma(N(1650)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{40}/Γ
3.76±0.28^{+1.37}_{-1.66}	1.1k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

 $\Gamma(N(1720)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{41}/Γ
1.79±0.10^{+0.24}_{-0.71}	0.5k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

 $\Gamma(N(2300)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{42}/Γ
2.62±0.28^{+1.12}_{-0.64}	0.9k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

 $\Gamma(N(2570)\bar{p} + \text{c.c.} \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE</u> (units 10^{-5})	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{43}/Γ
2.13±0.08^{+0.40}_{-0.30}	0.8k	¹ ABLIKIM	13A BES3	$\psi(2S) \rightarrow p\bar{p}\pi^0$	

¹ From a fit of $\pi^0 p\bar{p}$ data to eight distinct intermediate $N\bar{p}$ resonant states.

NODE=M071R35

NODE=M071R35

NEW

NODE=M071R35;LINKAGE=AB

NODE=M071S56

NODE=M071S56

NODE=M071S56;LINKAGE=AB

NODE=M071S50

NODE=M071S50

NEW

NODE=M071S57

NODE=M071S57

NODE=M071S58

NODE=M071S58

NODE=M071S58;LINKAGE=AB

NODE=M071S59

NODE=M071S59

NODE=M071S60;LINKAGE=AB

NODE=M071S60

NODE=M071S60

NODE=M071S61;LINKAGE=AB

NODE=M071S62

NODE=M071S62

NODE=M071S62;LINKAGE=AB

$\Gamma(\pi^0 f_0(2100) \rightarrow \pi^0 p\bar{p})/\Gamma_{\text{total}}$	Γ_{44}/Γ				
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.1±0.4±0.1	76	1 ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \pi^0 p\bar{p}$	

¹ From a fit of the $p\bar{p}$ and $p\pi^0$ mass distributions to a combination of $N_1^*(1440)\bar{p}$, $\pi^0 f_0(2100)$, and two other broad, unestablished resonances.

$\Gamma(\eta p\bar{p})/\Gamma_{\text{total}}$	Γ_{45}/Γ				
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
5.7±0.6 OUR AVERAGE					
5.6±0.6±0.3	154	ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \eta p\bar{p}$	
5.8±1.1±0.7	44.8 ± 8.5	1 ABLIKIM	05E BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\gamma\gamma$	
8 ± 3 ± 3	9.8	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-$	

¹ Computed using $B(\eta \rightarrow \gamma\gamma) = (39.43 \pm 0.26)\%$.

$\Gamma(\eta f_0(2100) \rightarrow \eta p\bar{p})/\Gamma_{\text{total}}$	Γ_{46}/Γ				
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.2±0.4±0.1	31	1 ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \eta p\bar{p}$	

¹ From a fit of the $p\bar{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\bar{p}$ and $\eta f_0(2100)$.

$\Gamma(N(1535)\bar{p} \rightarrow \eta p\bar{p})/\Gamma_{\text{total}}$	Γ_{47}/Γ				
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.4±0.6±0.3	123	1 ALEXANDER	10 CLEO	$\psi(2S) \rightarrow \eta p\bar{p}$	

¹ From a fit of the $p\bar{p}$ and $p\eta$ distributions to a combination of $N^*(1535)\bar{p}$ and $\eta f_0(2100)$.

$\Gamma(\omega p\bar{p})/\Gamma_{\text{total}}$	Γ_{48}/Γ				
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
0.69±0.21 OUR AVERAGE					
0.6 ± 0.2 ± 0.2	21.2	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$	
0.8 ± 0.3 ± 0.1	14.9 ± 0.1	1 BAI	03B BES	$\psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$	

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\phi p\bar{p})/\Gamma_{\text{total}}$	Γ_{49}/Γ				
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.24	90	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+K^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.26	90	1 BAI	03B BES	$\psi(2S) \rightarrow K^+K^-\bar{p}\bar{p}$
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¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\pi^+\pi^- p\bar{p})/\Gamma_{\text{total}}$	Γ_{50}/Γ				
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
6.0±0.4 OUR AVERAGE					
5.9±0.2±0.4	904.5	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-$	
8 ± 2		1 TANENBAUM	78 MRK1	$e^+ e^- \rightarrow$	

¹ Assuming entirely strong decay.

$\Gamma(p\bar{n}\pi^- \text{ or c.c.})/\Gamma_{\text{total}}$	Γ_{51}/Γ				
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.48±0.17 OUR AVERAGE					
2.45±0.11±0.21	851	ABLIKIM	06I BES2	$e^+ e^- \rightarrow p\pi^- X$	
2.52±0.12±0.22	849	ABLIKIM	06I BES2	$e^+ e^- \rightarrow \bar{p}\pi^+ X$	

$\Gamma(p\bar{n}\pi^-\pi^0)/\Gamma_{\text{total}}$	Γ_{52}/Γ				
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.18±0.50±0.50	135 ± 21	ABLIKIM	06I BES2	$e^+ e^- \rightarrow p\pi^-\pi^0 X$	

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{54}/Γ				
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.6	90	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$	

NODE=M071S51
NODE=M071S51

NODE=M071S51;LINKAGE=AL

NODE=M071R56
NODE=M071R56

NODE=M071R56;LINKAGE=AB

NODE=M071S52
NODE=M071S52

NODE=M071S52;LINKAGE=AL

NODE=M071S53
NODE=M071S53

NODE=M071S53;LINKAGE=AL

NODE=M071R79
NODE=M071R79

NODE=M071R82;LINKAGE=B3

NODE=M071R82
NODE=M071R82

OCCUR=2

NODE=M071R01
NODE=M071R01

NODE=M071R02
NODE=M071R02

NODE=M071S06
NODE=M071S06

$\Gamma(\eta\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{55}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
9.5±0.7±1.5		¹ BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadr}$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
10.3±0.8±1.4	201.7	² BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow \eta 3\pi (\eta \rightarrow \gamma\gamma)$	OCCUR=2
8.1±1.4±1.6	50.0	² BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow \eta 3\pi (\eta \rightarrow 3\pi)$	OCCUR=3

¹ Average of $\eta \rightarrow \gamma\gamma$ and $\eta \rightarrow 3\pi$.

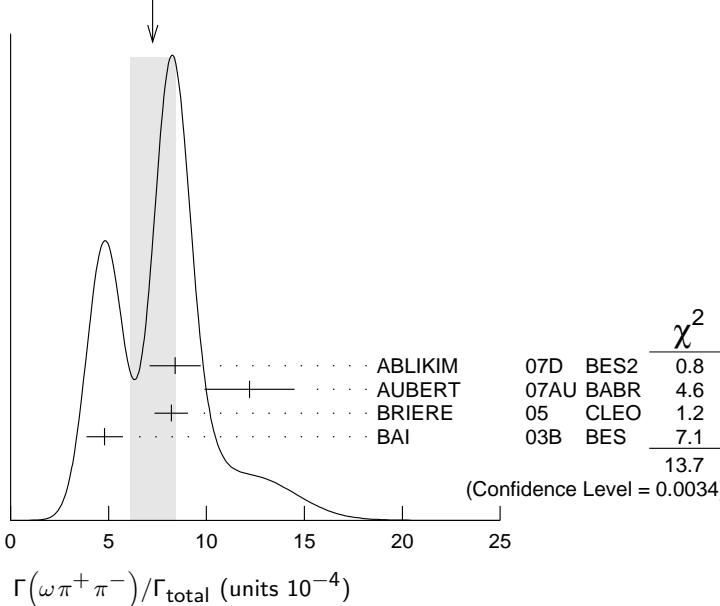
² Not independent from other values reported by BRIERE 05.

$\Gamma(2(\pi^+\pi^-)\eta)/\Gamma_{\text{total}}$					Γ_{56}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.2±0.6±0.1	16	¹ AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow 2(\pi^+\pi^-)\eta\gamma$	
1 AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow 2(\pi^+\pi^-)\eta) \cdot B(\eta \rightarrow \gamma\gamma) = 1.2 \pm 0.7 \pm 0.1 \text{ eV}$.					

$\Gamma(\eta'\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{57}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.5±1.6±1.3	12.8	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow \text{hadr}$	

$\Gamma(\omega\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{58}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
7.3±1.2 OUR AVERAGE		Error includes scale factor of 2.1. See the ideogram below.			
8.4±0.5±1.2	386	ABLIKIM	07D BES2	$e^+e^- \rightarrow \psi(2S)$	
12.2±2.2±0.7	37	¹ AUBERT	07AU BABR	10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$	
8.2±0.5±0.7	391	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$	
4.8±0.6±0.7	100 ± 22	² BAI	03B BES	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$	
1 AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow \omega\pi^+\pi^-) \cdot B(\omega \rightarrow 3\pi) = 2.69 \pm 0.73 \pm 0.16 \text{ eV}$.					
2 Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.					

WEIGHTED AVERAGE
7.3±1.2 (Error scaled by 2.1)



$\Gamma(b_1^\pm\pi^\mp)/\Gamma_{\text{total}}$					Γ_{59}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
4.0 ±0.6 OUR AVERAGE		Error includes scale factor of 1.1.			
5.1 ±0.6 ±0.8	202	ABLIKIM	07D BES2	$e^+e^- \rightarrow \psi(2S)$	
4.18 ^{+0.43} _{-0.42} ±0.92	170	ADAM	05 CLEO	$e^+e^- \rightarrow \psi(2S)$	
3.2 ±0.6 ±0.5	61 ± 11	^{1,2} BAI	03B BES	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.2 ±0.8 ±1.0		¹ BAI	99C BES	Repl. by BAI 03B	

NODE=M071S07
NODE=M071S07

OCCUR=2

OCCUR=3

NODE=M071S07;LINKAGE=BR
NODE=M071S07;LINKAGE=BI

NODE=M071S38
NODE=M071S38

NODE=M071S38;LINKAGE=UB

NODE=M071S08
NODE=M071S08

NODE=M071R77
NODE=M071R77

NODE=M071R77;LINKAGE=UB

NODE=M071R77;LINKAGE=B3

NODE=M071R40
NODE=M071R40

¹ Assuming $B(b_1 \rightarrow \omega\pi) = 1$.

² Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(b_1^0\pi^0)/\Gamma_{\text{total}}$					Γ_{60}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.35$\pm 0.47 \pm 0.40$	45	ADAM	05	CLEO $e^+e^- \rightarrow \psi(2S)$	

$\Gamma(\omega f_2(1270))/\Gamma_{\text{total}}$					Γ_{61}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.2 ± 0.4 OUR AVERAGE					
2.3 $\pm 0.5 \pm 0.4$		57	ABLIKIM	07D BES2	$e^+e^- \rightarrow \psi(2S)$
2.05 $\pm 0.41 \pm 0.38$		62 ± 12	BAI	04C BES2	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.5		90	¹ BAI	03B BES	$\psi(2S) \rightarrow 2(\pi^+\pi^-)\pi^0$
<1.7		90	BAI	98J BES	Repl. by BAI 03B

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.

$\Gamma(\pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}$					Γ_{62}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
7.5± 0.9 OUR AVERAGE				Error includes scale factor of 1.9. [(7.5 ± 0.9) $\times 10^{-4}$ OUR 2012 AVERAGE Scale factor = 1.9]	
10.8 $\pm 1.9 \pm 0.2$	85	¹ AUBERT	07AK BABR	$10.6 e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$	
7.1 $\pm 0.3 \pm 0.4$	817.2	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow K^+K^-\pi^+\pi^-$	
16 ± 4		² TANENBAUM	78	MRK1 e^+e^-	
1 AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (2.56 \pm 0.42 \pm 0.16) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.					
2 Assuming entirely strong decay.					
2.2$\pm 0.2 \pm 0.4$	223.8	BRIERE	05	CLEO $e^+e^- \rightarrow \psi(2S) \rightarrow K^+K^-\pi^+\pi^-$	

$\Gamma(K^*(892)^0\bar{K}_2^*(1430)^0)/\Gamma_{\text{total}}$					Γ_{64}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.86$\pm 0.32 \pm 0.43$		93 ± 16	BAI	04C	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.2		90	BAI	98J BES	e^+e^-

$\Gamma(K^+K^-\pi^+\pi^-\eta)/\Gamma_{\text{total}}$					Γ_{65}/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.3$\pm 0.7 \pm 0.1$	7	¹ AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\eta\gamma$	
1 AUBERT 07AU quotes $\Gamma_{ee}^{\psi(2S)} \cdot B(\psi(2S) \rightarrow 2(\pi^+\pi^-\eta)) \cdot B(\eta \rightarrow \gamma\gamma) = 1.2 \pm 0.7 \pm 0.1$ eV.					

$\Gamma(K^+K^-\pi^+\pi^-\eta)/\Gamma_{\text{total}}$					Γ_{66}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
10.0$\pm 2.5 \pm 1.8$	65	ABLIKIM	07D BES2	$e^+e^- \rightarrow \psi(2S)$	

$\Gamma(K_1(1270)^{\pm}K^{\mp})/\Gamma_{\text{total}}$					Γ_{68}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
10.0$\pm 1.8 \pm 2.1$		¹ BAI	99C BES	e^+e^-	

¹ Assuming $B(K_1(1270) \rightarrow K\rho) = 0.42 \pm 0.06$

$\Gamma(K_S^0K_S^0\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{69}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.20$\pm 0.25 \pm 0.37$	83 ± 9	ABLIKIM	050 BES2	$e^+e^- \rightarrow \psi(2S)$	

NODE=M071R;LINKAGE=M1
NODE=M071R40;LINKAGE=B3

NODE=M071R21
NODE=M071R21

NODE=M071R64
NODE=M071R64

NODE=M071R64;LINKAGE=B3

NODE=M071R24
NODE=M071R24

NEW

NODE=M071R24;LINKAGE=BE

NODE=M071R24;LINKAGE=K

NODE=M071S09
NODE=M071S09

NODE=M071R66
NODE=M071R66

NODE=M071S39
NODE=M071S39

NODE=M071S39;LINKAGE=UB

NODE=M071R09
NODE=M071R09

NODE=M071R41
NODE=M071R41

NODE=M071R;LINKAGE=M2

NODE=M071R49
NODE=M071R49

$\Gamma(\rho^0 p\bar{p})/\Gamma_{\text{total}}$					Γ_{70}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S14 NODE=M071S14
0.5±0.1±0.2	61.1	BRIERE	05	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-$		
$\Gamma(K^+\bar{K}^*(892)^0\pi^- + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{71}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071R34 NODE=M071R34
6.7±2.5		TANENBAUM 78	MRK1	$e^+ e^-$		
$\Gamma(2(\pi^+\pi^-))/\Gamma_{\text{total}}$					Γ_{72}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071R27 NODE=M071R27
2.4±0.6 OUR AVERAGE	Error includes scale factor of 2.2.					
2.2±0.2±0.2	308	BRIERE	05	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)$		
4.5±1.0		TANENBAUM 78	MRK1	$e^+ e^-$		
$\Gamma(\rho^0\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{73}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071R33 NODE=M071R33
2.2±0.6 OUR AVERAGE	Error includes scale factor of 1.4.					
2.0±0.2±0.4	285.5	BRIERE	05	CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow 2(\pi^+\pi^-)$		
4.2±1.5		TANENBAUM 78	MRK1	$e^+ e^-$		
$\Gamma(K^+K^-\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{74}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S10 NODE=M071S10
12.6±0.9 OUR AVERAGE						
18.6±5.6±0.3	32	¹ AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow K^+K^-\pi^+\pi^-\pi^0\gamma$		
11.7±1.0±1.5	597	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		
12.7±0.5±1.0	711.6	BRIERE	05 CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		
¹ AUBERT 07AU reports $[\Gamma(\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+e^-)] = (44 \pm 13 \pm 3) \times 10^{-4}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.						
$\Gamma(\omega f_0(1710) \rightarrow \omega K^+K^-)/\Gamma_{\text{total}}$					Γ_{75}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S20 NODE=M071S20
5.9±2.0±0.9	19	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		
$\Gamma(K^*(892)^0K^-\pi^+\pi^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{76}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S21 NODE=M071S21
8.6±1.3±1.8	238	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		
$\Gamma(K^*(892)^+K^-\pi^+\pi^- + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{77}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S22 NODE=M071S22
9.6±2.2±1.7	133	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		
$\Gamma(K^*(892)^+K^-\rho^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{78}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S23 NODE=M071S23
7.3±2.2±1.4	78	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		
$\Gamma(K^*(892)^0K^-\rho^+ + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{79}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M071S24 NODE=M071S24
6.1±1.3±1.2	125	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+K^-\pi^+\pi^-\pi^0$		

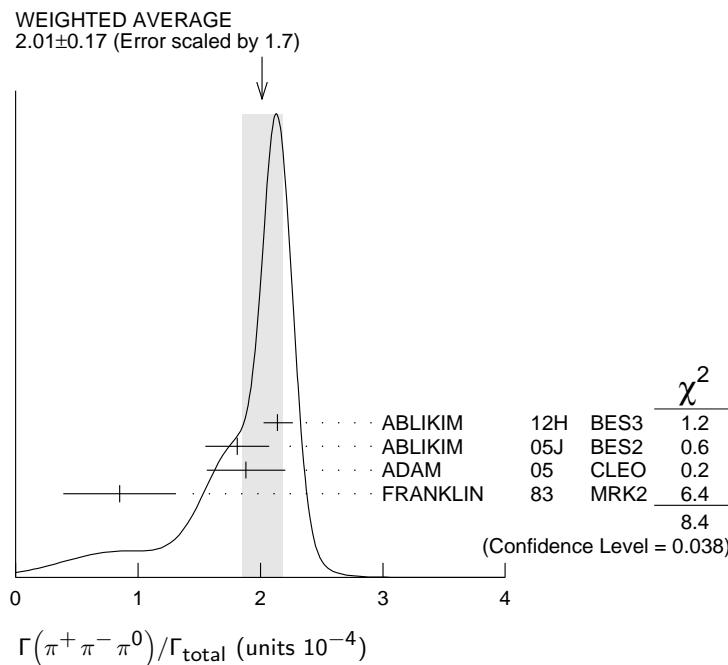
$\Gamma(\eta K^+ K^-, \text{no } \eta\phi)/\Gamma_{\text{total}}$					Γ_{80}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
3.08±0.29±0.25	0.3k	1	ABLIKIM	12L BES3	$\psi(2S) \rightarrow K^+ K^- \gamma\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<13	90	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	
1 Excluding $\eta\phi$.						
$\Gamma(\omega K^+ K^-)/\Gamma_{\text{total}}$					Γ_{81}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1.85±0.25 OUR AVERAGE	Error includes scale factor of 1.1.					
2.38±0.37±0.29	78	ABLIKIM	06G BES2	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$		
1.9 ± 0.3 ± 0.3	76.8	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	
1.5 ± 0.3 ± 0.2	23.0 ± 5.2	1 BAI	03B BES	$\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$		
1 Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.						
$\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$					Γ_{82}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
3.5 ± 2.0 OUR AVERAGE	Error includes scale factor of 2.8.					
5.45±0.42±0.87	671	ABLIKIM	05H BES2	$e^+ e^- \rightarrow \psi(2S) \rightarrow 3(\pi^+ \pi^-)$		
1.5 ± 1.0		1 TANENBAUM	78	MRK1	$e^+ e^-$	
1 Assuming entirely strong decay.						
$\Gamma(p\bar{p}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{83}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
7.3±0.4±0.6	434.9	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}\pi^+\pi^-\pi^0$	
$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$					Γ_{84}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
7.1 ± 0.5 OUR AVERAGE	Error includes scale factor of 1.5. [(6.3 ± 0.7) × 10 $^{-5}$ OUR 2012 AVERAGE]					
7.48±0.23±0.39	1.3k	1 METREVELI	12		$\psi(2S) \rightarrow K^+ K^-$	
6.3 ± 0.6 ± 0.3		DOBBS	06A	CLEO	$e^+ e^-$	
10 ± 7		BRANDELIK	79C	DASP	$e^+ e^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 5	90	FELDMAN	77	MRK1	$e^+ e^-$	
1 Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.						
$\Gamma(K_S^0 K_L^0)/\Gamma_{\text{total}}$					Γ_{85}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
5.34±0.33 OUR AVERAGE	[(5.4 ± 0.5) × 10 $^{-5}$ OUR 2012 AVERAGE]					
5.28±0.25±0.34	478 ± 23	1 METREVELI	12		$\psi(2S) \rightarrow K_S^0 K_L^0$	
5.8 ± 0.8 ± 0.4		DOBBS	06A	CLEO	$e^+ e^-$	
5.24±0.47±0.48	156 ± 14	2 BAI	04B BES2		$\psi(2S) \rightarrow K_S^0 K_L^0 \rightarrow \pi^+ \pi^- X$	
1 Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration.						
2 Using $B(K_S^0 \rightarrow \pi^+ \pi^-) = 0.6860 \pm 0.0027$.						
$\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$					Γ_{86}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
2.01±0.17 OUR AVERAGE	Error includes scale factor of 1.7. See the ideogram below. [(1.68 ± 0.26) × 10 $^{-4}$ OUR 2012 AVERAGE Scale factor = 1.4]					
2.14±0.03 ^{+0.12} _{-0.11}	7k	1 ABLIKIM	12H BES3	$e^+ e^- \rightarrow \psi(2S)$		
1.81±0.18±0.19	260 ± 19	2 ABLIKIM	05J BES2	$e^+ e^- \rightarrow \psi(2S)$		
1.88 ^{+0.16} _{-0.15} ±0.28	194	ADAM	05	CLEO	$e^+ e^- \rightarrow \psi(2S)$	
0.85±0.46	4	FRANKLIN	83	MRK2	$e^+ e^- \rightarrow \text{hadrons}$	

¹ From $\psi(2S) \rightarrow \pi^+ \pi^- \pi^0$ events directly. The quoted systematic error includes a contribution of 4% (added in quadrature) from the uncertainty on the number of $\psi(2S)$ events.

² From a PW analysis of $\psi(2S) \rightarrow \pi^+ \pi^- \pi^0$.

NODE=M071R36;LINKAGE=AB

NODE=M071R;LINKAGE=AK



$\Gamma(\rho(2150)\pi \rightarrow \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{87}/Γ

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT	Γ_{87}/Γ
$1.94 \pm 0.25 \pm 1.15$	1 ABLIKIM	05J BES2	$\psi(2S) \rightarrow \rho(2150)\pi \rightarrow \pi^+ \pi^- \pi^0$	

¹ From a PW analysis of $\psi(2S) \rightarrow \pi^+ \pi^- \pi^0$.

NODE=M071R57
NODE=M071R57

$\Gamma(\rho(770)\pi \rightarrow \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$ Γ_{88}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{88}/Γ
0.32 ± 0.12 OUR AVERAGE					Error includes scale factor of 1.8.	

$0.51 \pm 0.07 \pm 0.11$	1	ABLIKIM	05J BES2	$\psi(2S) \rightarrow \rho(770)\pi \rightarrow \pi^+ \pi^- \pi^0$	
$0.24^{+0.08}_{-0.07} \pm 0.02$	22	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.83	90	1	FRANKLIN	83 MRK2	$e^+ e^-$
<10	90		BARTEL	76 CNTR	$e^+ e^-$
<10	90	2	ABRAMS	75 MRK1	$e^+ e^-$

¹ From a PW analysis of $\psi(2S) \rightarrow \pi^+ \pi^- \pi^0$.

² Final state $\rho^0 \pi^0$.

NODE=M071R57;LINKAGE=AK

NODE=M071R26
NODE=M071R26

$\Gamma(\pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_{89}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{89}/Γ
0.78 ± 0.26 OUR AVERAGE						

$[(8 \pm 5) \times 10^{-5}$ OUR 2012 AVERAGE]

$0.76 \pm 0.25 \pm 0.06$	30	1 METREVELI	12	$\psi(2S) \rightarrow \pi^+ \pi^-$
8 ± 5		BRANDELIK	79C DASP	$e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<2.1	90	DOBBS	06A CLEO	$e^+ e^- \rightarrow \psi(2S)$
<5	90	FELDMAN	77 MRK1	$e^+ e^-$

NODE=M071R26;LINKAGE=AK

NODE=M071R;LINKAGE=N

NODE=M071R20
NODE=M071R20

NEW

¹ Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration. Using $\psi(3770) \rightarrow \pi^+ \pi^-$ for continuum subtraction.

NODE=M071R20;LINKAGE=ME

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{90}/Γ
<3.1	90	1 BAI	99C BES	$e^+ e^-$	

¹ Assuming $B(K_1(1400) \rightarrow K^* \pi) = 0.94 \pm 0.06$

NODE=M071R45
NODE=M071R45

NODE=M071R;LINKAGE=M3

$\Gamma(K_2^*(1430)^{\pm} K^{\mp})/\Gamma_{\text{total}}$				Γ_{91}/Γ
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7.12 \pm 0.62 \pm 1.13 -0.61	251 \pm 22	ABLIKIM	12L BES3	$e^+ e^- \rightarrow \psi(2S)$

$\Gamma(K^+ K^- \pi^0)/\Gamma_{\text{total}}$				Γ_{92}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4.07 \pm 0.16 \pm 0.26	0.9k	ABLIKIM	12L BES3	$e^+ e^- \rightarrow \psi(2S)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<8.9 90 1 FRANKLIN 83 MRK2 $e^+ e^- \rightarrow \text{hadrons}$

$\Gamma(K^+ K^*(892)^- + \text{c.c.})/\Gamma_{\text{total}}$				Γ_{93}/Γ	
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.9 \pm 0.4 OUR AVERAGE					Error includes scale factor of 1.2. $[(1.7^{+0.8}_{-0.7}) \times 10^{-5}]$
OUR 2012 AVERAGE]					
3.18 \pm 0.30 \pm 0.26 -0.31		0.2k	ABLIKIM	12L BES3	$e^+ e^- \rightarrow \psi(2S)$
2.9 \pm 1.3 \pm 0.4 -1.7		9.6 \pm 4.2	ABLIKIM	05I BES2	$e^+ e^- \rightarrow \psi(2S)$
1.3 \pm 1.0 \pm 0.3 -0.7		7	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<5.4 90 FRANKLIN 83 MRK2 $e^+ e^- \rightarrow \text{hadrons}$

$\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$				Γ_{94}/Γ
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
10.9 \pm 2.0 OUR AVERAGE				
13.3 \pm 2.4 -2.8	65.6 \pm 9.0	ABLIKIM	05I BES2	$e^+ e^- \rightarrow \psi(2S)$

9.2 \pm 2.7 \pm 0.9
-2.2

$\Gamma(K^+ K^*(892)^- + \text{c.c.})/\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})$				Γ_{93}/Γ_{94}
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.16 \pm 0.06 OUR AVERAGE				
0.22 \pm 0.10 -0.14	ABLIKIM	05I BES2	$e^+ e^- \rightarrow \psi(2S)$	
0.14 \pm 0.08 -0.06	ADAM	05 CLEO	$e^+ e^- \rightarrow \psi(2S)$	

$\Gamma(\phi \pi^+ \pi^-)/\Gamma_{\text{total}}$				Γ_{95}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.17 \pm 0.29 OUR AVERAGE				Error includes scale factor of 1.7.

2.40 \pm 0.94 \pm 0.04 10 \pm 4 1,2 AUBERT 07AK BABR $10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$
0.9 \pm 0.2 \pm 0.1 47.6 BRIERE 05 CLEO $e^+ e^- \rightarrow \psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$
1.5 \pm 0.2 \pm 0.2 51.5 \pm 8.3 3 BAI 03B BES $\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$

¹ AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \phi \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (0.57 \pm 0.22 \pm 0.04) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.

³ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(\phi f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}$				Γ_{96}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.68 \pm 0.24 OUR AVERAGE				Error includes scale factor of 1.1. $[(0.68 \pm 0.25) \times 10^{-4}]$
OUR 2012 AVERAGE Scale factor = 1.1]				

1.43 \pm 0.70 \pm 0.02 6 \pm 3 1,2 AUBERT 07AK BABR $10.6 e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$
0.6 \pm 0.2 \pm 0.1 18.4 \pm 6.4 3 BAI 03B BES $\psi(2S) \rightarrow K^+ K^- \pi^+ \pi^-$

¹ AUBERT 07AK reports $[\Gamma(\psi(2S) \rightarrow \phi f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma_{\text{total}}] \times [\Gamma(\psi(2S) \rightarrow e^+ e^-)] = (0.34 \pm 0.16 \pm 0.04) \times 10^{-3}$ keV which we divide by our best value $\Gamma(\psi(2S) \rightarrow e^+ e^-) = 2.37 \pm 0.04$ keV. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² Using $B(\phi \rightarrow K^+ K^-) = (49.3 \pm 0.6)\%$.

³ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

NODE=M071S54
NODE=M071S54

NODE=M071R38
NODE=M071R38

NODE=M071R39
NODE=M071R39
NEW

NODE=M071R30
NODE=M071R30

NODE=M071R46
NODE=M071R46

NODE=M071R80
NODE=M071R80

NODE=M071R80;LINKAGE=BE
NODE=M071R80;LINKAGE=UB
NODE=M071R80;LINKAGE=B3

NODE=M071R83
NODE=M071R83

NEW

NODE=M071R83;LINKAGE=BE

NODE=M071R83;LINKAGE=UB
NODE=M071R83;LINKAGE=B3

$\Gamma(2(K^+ K^-))/\Gamma_{\text{total}}$					Γ_{97}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
0.6±0.1±0.1	59.2	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(K^+ K^-)$

NODE=M071S12
NODE=M071S12

$\Gamma(\phi K^+ K^-)/\Gamma_{\text{total}}$					Γ_{98}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
0.70±0.16 OUR AVERAGE					
0.8 ± 0.2 ± 0.1	36.8	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(K^+ K^-)$
0.6 ± 0.2 ± 0.1	16.1 ± 5.0	¹ BAI	03B	BES	$\psi(2S) \rightarrow 2(K^+ K^-)$

NODE=M071R81
NODE=M071R81

¹ Normalized to $B(\psi(2S) \rightarrow J/\psi \pi^+ \pi^-) = 0.305 \pm 0.016$.

$\Gamma(2(K^+ K^-)\pi^0)/\Gamma_{\text{total}}$					Γ_{99}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.1±0.2±0.2	44.7	BRIERE	05	CLEO	$e^+ e^- \rightarrow \psi(2S) \rightarrow 2(K^+ K^-)\pi^0$

NODE=M071S13
NODE=M071S13

$\Gamma(\phi\eta)/\Gamma_{\text{total}}$					Γ_{100}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.10±0.31 OUR AVERAGE					
$[(2.8^{+1.0}_{-0.8}) \times 10^{-5}]$ OUR 2012 AVERAGE]					
3.14 ± 0.23 ± 0.23	0.2k	ABLIKIM	12L	BES3	$e^+ e^- \rightarrow \psi(2S)$
2.0 $^{+1.5}_{-1.1}$ ± 0.4	6	ADAM	05	CLEO	$e^+ e^- \rightarrow \psi(2S)$
3.3 ± 1.1 ± 0.5	17	ABLIKIM	04K	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R89
NODE=M071R89
NEW

$\Gamma(\phi\eta')/\Gamma_{\text{total}}$					Γ_{101}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.1±1.4±0.7	8	¹ ABLIKIM	04K	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R90
NODE=M071R90

¹ Calculated combining $\eta' \rightarrow \gamma\rho$ and $\eta\pi^+\pi^-$ channels.

$\Gamma(\omega\eta')/\Gamma_{\text{total}}$					Γ_{102}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.2$^{+2.4}_{-2.0}$±0.7	4	¹ ABLIKIM	04K	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R91
NODE=M071R91

¹ Calculated combining $\eta' \rightarrow \gamma\rho$ and $\eta\pi^+\pi^-$ channels.

$\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$					Γ_{103}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.1 ± 0.6 OUR AVERAGE					
2.5 $^{+1.2}_{-1.0}$ ± 0.2	14	ADAM	05	CLEO	$e^+ e^- \rightarrow \psi(2S)$
1.87 $^{+0.68}_{-0.62}$ ± 0.28	14	ABLIKIM	04L	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R91;LINKAGE=AI

NODE=M071R92
NODE=M071R92

$\Gamma(\rho\eta')/\Gamma_{\text{total}}$					Γ_{104}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.87$^{+1.64}_{-1.11}$±0.33	2	ABLIKIM	04L	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R93
NODE=M071R93

$\Gamma(\rho\eta)/\Gamma_{\text{total}}$					Γ_{105}/Γ
VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.2 ± 0.6 OUR AVERAGE				Error includes scale factor of 1.1.	
3.0 $^{+1.1}_{-0.9}$ ± 0.2	18	ADAM	05	CLEO	$e^+ e^- \rightarrow \psi(2S)$
1.78 $^{+0.67}_{-0.62}$ ± 0.17	13	ABLIKIM	04L	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R94
NODE=M071R94

$\Gamma(\omega\eta)/\Gamma_{\text{total}}$					Γ_{106}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.1	90	ADAM	05	CLEO	$e^+ e^- \rightarrow \psi(2S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.1	90	ABLIKIM	04K	BES	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071R95
NODE=M071R95

$\Gamma(\phi\pi^0)/\Gamma_{\text{total}}$	Γ_{107}/Γ	NODE=M071R96 NODE=M071R96
$\text{VALUE (units } 10^{-5}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<0.04 \text{ (CL = 90\%)} \quad [<0.4 \times 10^{-5} \text{ (CL = 90\%) OUR 2012 BEST LIMIT}]$		
$<0.04 \quad 90 \quad \text{ABLIKIM} \quad 12L \quad \text{BES3} \quad e^+ e^- \rightarrow \psi(2S)$		
• • • We do not use the following data for averages, fits, limits, etc. • • •		
$<0.7 \quad 90 \quad \text{ADAM} \quad 05 \quad \text{CLEO} \quad e^+ e^- \rightarrow \psi(2S)$		
$<0.4 \quad 90 \quad \text{ABLIKIM} \quad 04K \quad \text{BES} \quad e^+ e^- \rightarrow \psi(2S)$		
$\Gamma(\eta_c\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$	Γ_{108}/Γ	NODE=M071R03 NODE=M071R03
$\text{VALUE (units } 10^{-3}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<1.0 \quad 90 \quad \text{PEDLAR} \quad 07 \quad \text{CLEO} \quad e^+ e^- \rightarrow \psi(2S)$		
$\Gamma(p\bar{p}K^+K^-)/\Gamma_{\text{total}}$	Γ_{109}/Γ	NODE=M071S16 NODE=M071S16
$\text{VALUE (units } 10^{-5}\text{)} \quad EVTS$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$2.7 \pm 0.6 \pm 0.4 \quad 30.1 \quad \text{BRIERE} \quad 05 \quad \text{CLEO} \quad e^+ e^- \rightarrow \psi(2S) \rightarrow p\bar{p}K^+K^-$		
$\Gamma(\bar{\Lambda}nK_S^0 + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{110}/Γ	NODE=M071R08 NODE=M071R08
$\text{VALUE (units } 10^{-4}\text{)} \quad EVTS$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$0.81 \pm 0.11 \pm 0.14 \quad 50 \quad ^1 \text{ ABLIKIM} \quad 08C \quad \text{BES2} \quad e^+ e^- \rightarrow J/\psi$		
• Using $B(\bar{\Lambda} \rightarrow \bar{p}\pi^+) = 63.9\%$ and $B(K_S^0 \rightarrow \pi^+\pi^-) = 69.2\%.$		
• • • We do not use the following data for averages, fits, limits, etc. • • •		
$<0.45 \quad 90 \quad \text{BAI} \quad 98J \quad \text{BES} \quad e^+ e^- \rightarrow 2(K^+K^-)$		
$\Gamma(\phi f_2'(1525))/\Gamma_{\text{total}}$	Γ_{111}/Γ	NODE=M071R67 NODE=M071R67
$\text{VALUE (units } 10^{-4}\text{)} \quad CL\% \quad EVTS$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$0.44 \pm 0.12 \pm 0.11 \quad 20 \pm 6 \quad \text{BAI} \quad 04C \quad \psi(2S) \rightarrow 2(K^+K^-)$		
• • • We do not use the following data for averages, fits, limits, etc. • • •		
$<0.45 \quad 90 \quad \text{BAI} \quad 98J \quad \text{BES} \quad e^+ e^- \rightarrow 2(K^+K^-)$		
$\Gamma(\Theta(1540)\bar{\Theta}(1540) \rightarrow K_S^0 p K^- \bar{n} + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{112}/Γ	NODE=M071S01 NODE=M071S01
$\text{VALUE (units } 10^{-5}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<0.88 \quad 90 \quad \text{BAI} \quad 04G \quad \text{BES2} \quad e^+ e^-$		
$\Gamma(\Theta(1540)K^- \bar{n} \rightarrow K_S^0 p K^- \bar{n})/\Gamma_{\text{total}}$	Γ_{113}/Γ	NODE=M071S02 NODE=M071S02
$\text{VALUE (units } 10^{-5}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<1.0 \quad 90 \quad \text{BAI} \quad 04G \quad \text{BES2} \quad e^+ e^-$		
$\Gamma(\Theta(1540)K_S^0 \bar{p} \rightarrow K_S^0 \bar{p} K^+ n)/\Gamma_{\text{total}}$	Γ_{114}/Γ	NODE=M071S03 NODE=M071S03
$\text{VALUE (units } 10^{-5}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<0.70 \quad 90 \quad \text{BAI} \quad 04G \quad \text{BES2} \quad e^+ e^-$		
$\Gamma(\bar{\Theta}(1540)K^+ n \rightarrow K_S^0 \bar{p} K^+ n)/\Gamma_{\text{total}}$	Γ_{115}/Γ	NODE=M071S04 NODE=M071S04
$\text{VALUE (units } 10^{-5}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<2.6 \quad 90 \quad \text{BAI} \quad 04G \quad \text{BES2} \quad e^+ e^-$		
$\Gamma(\bar{\Theta}(1540)K_S^0 p \rightarrow K_S^0 p K^- \bar{n})/\Gamma_{\text{total}}$	Γ_{116}/Γ	NODE=M071S05 NODE=M071S05
$\text{VALUE (units } 10^{-5}\text{)} \quad CL\%$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<0.60 \quad 90 \quad \text{BAI} \quad 04G \quad \text{BES2} \quad e^+ e^-$		
$\Gamma(K_S^0 K_S^0)/\Gamma_{\text{total}}$	Γ_{117}/Γ	NODE=M071R88 NODE=M071R88
$\text{VALUE (units } 10^{-4}\text{)}$	$\text{DOCUMENT ID} \quad \text{TECN} \quad \text{COMMENT}$	
$<0.046 \quad ^1 \text{ BAI} \quad 04D \quad \text{BES} \quad e^+ e^-$		

RADIATIVE DECAYS

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma_{\text{total}}$	Γ_{118}/Γ	NODE=M071R55			
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	NODE=M071R55
9.84 ± 0.31 OUR FIT [(9.68 ± 0.31) $\times 10^{-2}$ OUR 2012 FIT]					NEW
9.2 ± 0.4 OUR AVERAGE					
$9.22 \pm 0.11 \pm 0.46$	72600	ATHAR	04	CLEO $e^+ e^- \rightarrow \gamma X$	
$9.9 \pm 0.5 \pm 0.8$		¹ GAISER	86	CBAL $e^+ e^- \rightarrow \gamma X$	
7.2 ± 2.3		¹ BIDDICK	77	CNTR $e^+ e^- \rightarrow \gamma X$	
7.5 ± 2.6		¹ WHITAKER	76	MRK1 $e^+ e^-$	

¹ Angular distribution ($1+\cos^2\theta$) assumed.

$\Gamma(\gamma\chi_{c1}(1P))/\Gamma_{\text{total}}$					Γ_{119}/Γ
<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

9.3 \pm 0.4 OUR FIT[(9.2 ± 0.4) $\times 10^{-2}$ OUR 2012 FIT]**8.9 \pm 0.5 OUR AVERAGE**

9.07 \pm 0.11 \pm 0.54	76700	ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
9.0 \pm 0.5 \pm 0.7		1 GAISER	86	CBAL	$e^+ e^- \rightarrow \gamma X$
7.1 \pm 1.9		2 BIDDICK	77	CNTR	$e^+ e^- \rightarrow \gamma X$

¹ Angular distribution ($1 - 0.189 \cos^2\theta$) assumed.² Valid for isotropic distribution of the photon.

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma_{\text{total}}$					Γ_{120}/Γ
<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

8.76 \pm 0.34 OUR FIT[(8.72 ± 0.34) $\times 10^{-2}$ OUR 2012 FIT]**8.8 \pm 0.5 OUR AVERAGE** Error includes scale factor of 1.1.

9.33 \pm 0.14 \pm 0.61	79300	ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
8.0 \pm 0.5 \pm 0.7		1 GAISER	86	CBAL	$e^+ e^- \rightarrow \gamma X$
7.0 \pm 2.0		2 BIDDICK	77	CNTR	$e^+ e^- \rightarrow \gamma X$

¹ Angular distribution ($1 - 0.052 \cos^2\theta$) assumed.² Valid for isotropic distribution of the photon.

$[\Gamma(\gamma\chi_{c0}(1P)) + \Gamma(\gamma\chi_{c1}(1P)) + \Gamma(\gamma\chi_{c2}(1P))] / \Gamma_{\text{total}}$					$(\Gamma_{118} + \Gamma_{119} + \Gamma_{120}) / \Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

• • • We do not use the following data for averages, fits, limits, etc. • • •

27.6 \pm 0.3 \pm 2.0		¹ ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
--------------------------	--	--------------------	----	------	--------------------------------

¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c1}(1P))$					$\Gamma_{118}/\Gamma_{119}$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.02 \pm 0.01 \pm 0.07		¹ ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c2}(1P))/\Gamma(\gamma\chi_{c1}(1P))$					$\Gamma_{120}/\Gamma_{119}$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.03 \pm 0.02 \pm 0.03		¹ ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\chi_{c0}(1P))/\Gamma(\gamma\chi_{c2}(1P))$					$\Gamma_{118}/\Gamma_{120}$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.99 \pm 0.02 \pm 0.08		¹ ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
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¹ Not independent from ATHAR 04 measurements of $B(\gamma\chi_{cJ})$.

$\Gamma(\gamma\eta_c(1S))/\Gamma_{\text{total}}$					Γ_{121}/Γ
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

0.34 \pm 0.05 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

0.432 \pm 0.016 \pm 0.060		MITCHELL	09	CLEO	$e^+ e^- \rightarrow \gamma X$
0.32 \pm 0.04 \pm 0.06	2560	¹ ATHAR	04	CLEO	$e^+ e^- \rightarrow \gamma X$
0.28 \pm 0.06		² GAISER	86	CBAL	$e^+ e^- \rightarrow \gamma X$

¹ ATHAR 04 used $\Gamma_{\eta_c}(1S) = 24.8 \pm 4.9$ MeV to obtain this result.² GAISER 86 used $\Gamma_{\eta_c}(1S) = 11.5 \pm 4.5$ MeV to obtain this result.

NODE=M071R58

NODE=M071R58

NEW

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NODE=M071R;LINKAGE=B

NODE=M071R;LINKAGE=F

NODE=M071R59;LINKAGE=B

NODE=M071R19

NODE=M071R19

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NODE=M071R97

NODE=M071R97

NODE=M071R98;LINKAGE=AH

NODE=M071R98

NODE=M071R98

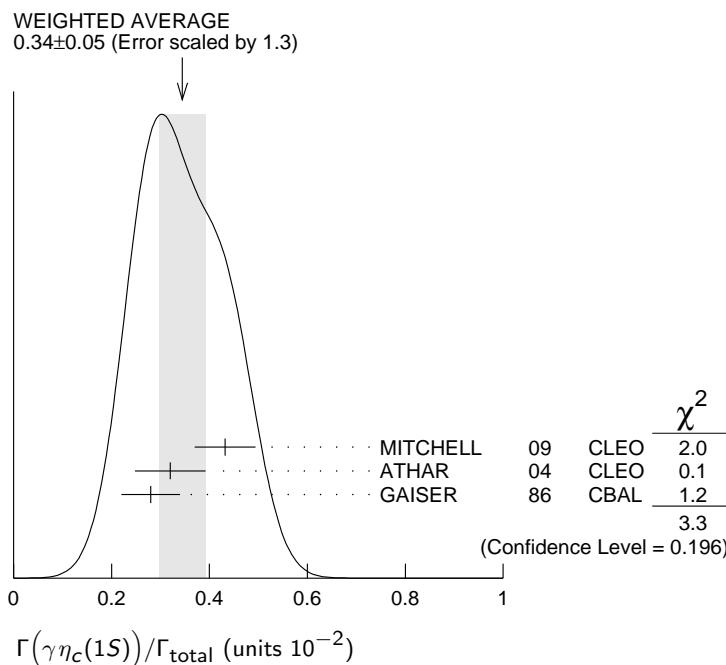
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NODE=M071R99

NODE=M071R99

NODE=M071R60;LINKAGE=AT

NODE=M071R60;LINKAGE=GA

 **$\Gamma(\gamma\eta_c(2S))/\Gamma_{\text{total}}$**

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
$7\pm2\pm4$		¹ ABLIKIM	12G	BES3 $\psi(2S) \rightarrow \gamma K^0 K\pi, K\bar{K}\pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 8	90	² CRONIN-HEN..	10	CLEO $\psi(2S) \rightarrow \gamma K\bar{K}\pi$
<20	90	ATHAR	04	CLEO $e^+e^- \rightarrow \gamma X$

20–130	95	EDWARDS	82C	CBAL $e^+e^- \rightarrow \gamma X$
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¹ ABLIKIM 12G reports $[\Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}] \times [B(\eta_c(2S) \rightarrow K\bar{K}\pi)] = (1.30 \pm 0.20 \pm 0.30) \times 10^{-5}$ which we divide by our best value $B(\eta_c(2S) \rightarrow K\bar{K}\pi) = (1.9 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

² CRONIN-HENNESSY 10 reports $[\Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}] \times [B(\eta_c(2S) \rightarrow K\bar{K}\pi)] < 14.5 \times 10^{-6}$ which we divide by our best value $B(\eta_c(2S) \rightarrow K\bar{K}\pi) = 1.9 \times 10^{-2}$. This measurement assumes $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

 $\Gamma(\gamma\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$1.58\pm0.40\pm0.13$		37	ABLIKIM	10F	BES3 $\psi(2S) \rightarrow \gamma\pi^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 5	90	PEDLAR	09	CLE3 $\psi(2S) \rightarrow \gamma X$
<5400	95	¹ LIBERMAN	75	SPEC e^+e^-
$< 1 \times 10^4$	90	WIIK	75	DASP e^+e^-

¹ Restated by us using $B(\psi(2S) \rightarrow \mu^+\mu^-) = 0.0077$.

 $\Gamma(\gamma\eta'(958))/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.23 ± 0.06 OUR AVERAGE					

$1.26\pm0.03\pm0.08$	2226	¹ ABLIKIM	10F	BES3	$\psi(2S) \rightarrow 3\gamma\pi^+\pi^-, 2\gamma\pi^+\pi^-$
$1.19\pm0.08\pm0.03$		PEDLAR	09	CLE3	$\psi(2S) \rightarrow \gamma X$
$1.24\pm0.27\pm0.15$	23	ABLIKIM	06R	BES2	$e^+e^- \rightarrow \psi(2S)$
$1.54\pm0.31\pm0.20$	~ 43	BAI	98F	BES	$\psi(2S) \rightarrow \pi^+\pi^- 2\gamma, \pi^+\pi^- 3\gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 60	90	2 BRAUNSCH...	77	DASP	e^+e^-
< 11	90	3 BARTEL	76	CNTR	e^+e^-

¹ Combining the results from $\eta' \rightarrow \pi^+\pi^-\eta$ and $\eta' \rightarrow \pi^+\pi^-\gamma$ decay modes.

² Restated by us using total decay width 228 keV.

³ The value is normalized to the branching ratio for $\Gamma(J/\psi(1S)\eta)/\Gamma_{\text{total}}$.

 Γ_{122}/Γ

NODE=M071R62
NODE=M071R62

NODE=M071R62;LINKAGE=AB

NODE=M071R62;LINKAGE=CR

NODE=M071R42
NODE=M071R42

NODE=M071R;LINKAGE=U

NODE=M071R44
NODE=M071R44

NODE=M071R44;LINKAGE=AB

NODE=M071R;LINKAGE=R

NODE=M071R;LINKAGE=C

$\Gamma(\gamma f_2(1270))/\Gamma_{\text{total}}$					Γ_{125}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$2.12 \pm 0.19 \pm 0.32$		1,2 BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi\pi$	
• • • We do not use the following data for averages, fits, limits, etc.				• • •	
$2.08 \pm 0.19 \pm 0.33$	200.6 ± 18.8	¹ BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$	OCCUR=2
$2.90 \pm 1.08 \pm 1.07$	29.9 ± 11.1	¹ BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^0\pi^0$	OCCUR=3
1 Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.					
2 Combining the results from $\pi^+\pi^-$ and $\pi^0\pi^0$ decay modes.					

$\Gamma(\gamma f_0(1710) \rightarrow \gamma\pi\pi)/\Gamma_{\text{total}}$					Γ_{127}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$0.301 \pm 0.041 \pm 0.124$	35.6 ± 4.8	¹ BAI	03C BES	$\psi(2S) \rightarrow \gamma\pi^+\pi^-$	NODE=M071R;LINKAGE=3B
1 Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.					

$\Gamma(\gamma f_0(1710) \rightarrow \gamma K\bar{K})/\Gamma_{\text{total}}$					Γ_{128}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$0.604 \pm 0.090 \pm 0.132$		39.6 ± 5.9	1,2 BAI	03C BES	$\psi(2S) \rightarrow \gamma K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc.			• • •		
< 1.56	90	6.8 ± 3.1	1,2 BAI	03C BES	$\psi(2S) \rightarrow \gamma K_S^0 K_S^0$
1 Includes unknown branching fractions to K^+K^- or $K_S^0 K_S^0$. We have multiplied the K^+K^- result by a factor of 2 and the $K_S^0 K_S^0$ result by a factor of 4 to obtain the $K\bar{K}$ result.					
2 Normalized to $B(\psi(2S) \rightarrow J/\psi\pi^+\pi^-) = 0.305 \pm 0.016$.					

$\Gamma(\gamma\eta)/\Gamma_{\text{total}}$					Γ_{130}/Γ
<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1.38 \pm 0.48 \pm 0.09$		13	¹ ABLIKIM	10F BES3	$\psi(2S) \rightarrow \gamma\pi^+\pi^-\pi^0, \gamma 3\pi^0$
• • • We do not use the following data for averages, fits, limits, etc.		• • •			
< 2	90	PEDLAR	09	CLE3	$\psi(2S) \rightarrow \gamma X$
< 90	90	BAI	98F	BES	$\psi(2S) \rightarrow \pi^+\pi^-3\gamma$
< 200	90	YAMADA	77	DASP	$e^+e^- \rightarrow 3\gamma$
1 Combining the results from $\eta \rightarrow \pi^+\pi^-\pi^0$ and $\eta \rightarrow 3\pi^0$ decay modes.					

$\Gamma(\gamma\eta\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{131}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$8.71 \pm 1.25 \pm 1.64$	418	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\eta\pi^+\pi^-$	NODE=M071R43;LINKAGE=AB

$\Gamma(\gamma\eta(1405) \rightarrow \gamma K\bar{K}\pi)/\Gamma_{\text{total}}$					Γ_{133}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 0.9	90	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma K_S^0 K^+\pi^- + \text{c.c.}$	NODE=M071R61 NODE=M071R61
• • • We do not use the following data for averages, fits, limits, etc.		• • •			
< 1.3	90	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma K^+K^-\pi^0$	OCCUR=2
< 1.2	90	¹ SCHARRE	80	MRK1	$e^+e^- \rightarrow K\bar{K}\pi$
1 Includes unknown branching fraction $\eta(1405) \rightarrow K\bar{K}\pi$.					

$\Gamma(\gamma\eta(1405) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{134}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$0.36 \pm 0.25 \pm 0.05$	10	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\eta\pi^+\pi^-$	NODE=M071R05 NODE=M071R05

$\Gamma(\gamma\eta(1475) \rightarrow K\bar{K}\pi)/\Gamma_{\text{total}}$					Γ_{136}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 1.4	90	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma K^+K^-\pi^0$	NODE=M071R06 NODE=M071R06
• • • We do not use the following data for averages, fits, limits, etc.		• • •			
< 1.5	90	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma K_S^0 K^+\pi^- + \text{c.c.}$	OCCUR=2

$\Gamma(\gamma\eta(1475) \rightarrow \eta\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{137}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 0.88	90	ABLIKIM	06R BES2	$\psi(2S) \rightarrow \gamma\eta\pi^+\pi^-$	NODE=M071R07 NODE=M071R07

$\Gamma(\gamma 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{138}/Γ
$39.6 \pm 2.8 \pm 5.0$	583	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

 $\Gamma(\gamma K^{*0} K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{139}/Γ
$37.0 \pm 6.1 \pm 7.2$	237	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

 $\Gamma(\gamma K^{*0} \bar{K}^{*0})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{140}/Γ
$24.0 \pm 4.5 \pm 5.0$	41	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

 $\Gamma(\gamma K_S^0 K^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{141}/Γ
$25.6 \pm 3.6 \pm 3.6$	115	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

 $\Gamma(\gamma K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{142}/Γ
$19.1 \pm 2.7 \pm 4.3$	132	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

 $\Gamma(\gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{143}/Γ
3.9 ± 0.5 OUR AVERAGE		Error includes scale factor of 2.0.			

$4.18 \pm 0.26 \pm 0.18$	348	¹ ALEXANDER	10	CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$
$2.9 \pm 0.4 \pm 0.4$	142	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

¹ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \rightarrow \pi^0 p\bar{p}$ and continuum.

 $\Gamma(\gamma f_2(1950) \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{144}/Γ
$1.2 \pm 0.2 \pm 0.1$	111	¹ ALEXANDER	10	CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$

¹ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \rightarrow \pi^0 p\bar{p}$ and continuum.

 $\Gamma(\gamma f_2(2150) \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{145}/Γ
$0.72 \pm 0.18 \pm 0.03$	73	¹ ALEXANDER	10	CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$

¹ From a fit of the $p\bar{p}$ mass distribution to a combination of $\gamma f_2(1950)$, $\gamma f_2(2150)$, and $\gamma p\bar{p}$ phase space, for $M(p\bar{p}) < 2.85$ GeV, and accounting for backgrounds from $\psi(2S) \rightarrow \pi^0 p\bar{p}$ and continuum.

 $\Gamma(\gamma X(1835) \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{146}/Γ
$4.57 \pm 0.36 \pm 1.77$		ABLIKIM	12D	BES3	$J/\psi \rightarrow \gamma p\bar{p}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.6	90	ALEXANDER	10	CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$
<5.4	90	ABLIKIM	07D	BES	$\psi(2S) \rightarrow \gamma p\bar{p}$

 $\Gamma(\gamma X \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{147}/Γ
<2	90	ALEXANDER	10	CLEO	$\psi(2S) \rightarrow \gamma p\bar{p}$

For a narrow resonance in the range $2.2 < M(X) < 2.8$ GeV.

<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{148}/Γ
$2.8 \pm 1.2 \pm 0.7$	17	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

 $\Gamma(\gamma 2(\pi^+ \pi^-) K^+ K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{149}/Γ
<22	90	ABLIKIM	07D	BES2	$e^+ e^- \rightarrow \psi(2S)$

NODE=M071S28
NODE=M071S28

NODE=M071S29
NODE=M071S29

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NODE=M071S30

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NODE=M071S49
NODE=M071S49

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NODE=M071S34

NODE=M071S35
NODE=M071S35

$\Gamma(\gamma 3(\pi^+\pi^-))/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%
<17	90

 Γ_{150}/Γ NODE=M071S36
NODE=M071S36 $\Gamma(\gamma K^+K^-K^+K^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%
<4	90

 Γ_{151}/Γ NODE=M071S37
NODE=M071S37 $\Gamma(\gamma\gamma J/\psi)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS
$3.1 \pm 0.6^{+0.8}_{-1.0}$	1.1k

 Γ_{152}/Γ NODE=M071S55
NODE=M071S55 **$\psi(2S)$ CROSS-PARTICLE BRANCHING RATIOS**

For measurements involving $B(\psi(2S) \rightarrow \gamma \chi_{cJ}(1P)) \times B(\chi_{cJ}(1P) \rightarrow X)$
see the corresponding entries in the $\chi_{cJ}(1P)$ sections.

MULTIPOLE AMPLITUDE RATIOS IN RADIATIVE DECAYS $\psi(2S) \rightarrow \gamma \chi_{cJ}(1P)$ and $\chi_{cJ} \rightarrow \gamma J/\psi(1S)$ **$a_2(\chi_{c1})/a_2(\chi_{c2})$ Magnetic quadrupole transition amplitude ratio**

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
67^{+19}_{-13}	59k	1 ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

¹ Statistical and systematic errors combined. Using values from fits with floating $M2$ amplitudes $a_2(\chi_{c1})$, $a_2(\chi_{c2})$, $b_2(\chi_{c1})$, $b_2(\chi_{c2})$ and fixed $E3$ amplitudes of $a_3(\chi_{c2}) = b_3(\chi_{c2}) = 0$. Not independent of values for $a_2(\chi_{c1}(1P))$ and $a_2(\chi_{c2}(1P))$ from ARTUSO 09.

 $b_2(\chi_{c2})/b_2(\chi_{c1})$ Magnetic quadrupole transition amplitude ratio

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
37^{+53}_{-47}	59k	1 ARTUSO	09	CLEO $\psi(2S) \rightarrow \gamma \gamma \ell^+ \ell^-$

¹ Statistical and systematic errors combined. Using values from fits with floating $M2$ amplitudes $a_2(\chi_{c1})$, $a_2(\chi_{c2})$, $b_2(\chi_{c1})$, $b_2(\chi_{c2})$ and fixed $E3$ amplitudes of $a_3(\chi_{c2}) = b_3(\chi_{c2}) = 0$. Not independent of values for $b_2(\chi_{c1}(1P))$ and $b_2(\chi_{c2}(1P))$ from ARTUSO 09.

 $\psi(2S)$ REFERENCES

ABLIKIM	13A	PRL 110 022001	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13D	PR D87 012007	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	13F	arXiv:1211.4682 (PR D)	M. Ablikim <i>et al.</i>	(BES III Collab.)
AAIJ	12H	EPJ C72 1972	R. Aaij <i>et al.</i>	(LHCb Collab.)
ABLIKIM	12D	PRL 108 112003	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12G	PRL 109 042003	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12H	PL B710 594	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12L	PR D86 072011	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12M	PR D86 092008	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	12O	PRL 109 172002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ANASHIN	12	PL B711 280	V.V. Anashin <i>et al.</i>	(KEDR Collab.)
LEES	12E	PR D85 112009	J.P. Lees <i>et al.</i>	(BABAR Collab.)
METREVELI	12	PR D85 092007	Z. Metreveli <i>et al.</i>	(NWES, FLOR, WAYN+)
GE	11	PR D84 032008	J.Y. Ge <i>et al.</i>	(CLEO Collab.)
ABLIKIM	10B	PRL 104 132002	M. Ablikim <i>et al.</i>	(BES III Collab.)
ABLIKIM	10F	PRL 105 261801	M. Ablikim <i>et al.</i>	(BES III Collab.)
ALEXANDER	10	PR D82 092002	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
CRONIN-HEN... ¹⁰	PR D81 052002	D. Cronin-Hennessey <i>et al.</i>	(CLEO Collab.)	
ADAMS	09	PR D80 051106	G.S. Adams <i>et al.</i>	(CLEO Collab.)
ARTUSO	09	PR D80 112003	M. Artuso <i>et al.</i>	(CLEO Collab.)
LIBBY	09	PR D80 072002	J. Libby <i>et al.</i>	(CLEO Collab.)
MITCHELL	09	PRL 102 011801	R.E. Mitchell <i>et al.</i>	(CLEO Collab.)
PEDLAR	09	PR D79 111101	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)
ABLIKIM	08B	PL B659 74	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	08C	PL B659 789	M. Ablikim <i>et al.</i>	(BES Collab.)
DOBBS	08A	PRL 101 182003	S. Dobbs <i>et al.</i>	(CLEO Collab.)
MENDEZ	08	PR D78 011102	H. Mendez <i>et al.</i>	(CLEO Collab.)
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
ABLIKIM	07C	PL B648 149	M. Ablikim <i>et al.</i>	(BES Collab.)
ABLIKIM	07D	PR D99 011802	M. Ablikim <i>et al.</i>	(BES II Collab.)
ABLIKIM	07H	PR D76 092003	M. Ablikim <i>et al.</i>	(BES Collab.)
ANASHIN	07	JETPL 85 347	V.V. Anashin <i>et al.</i>	(KEDR Collab.)

Translated from ZETFP 85 429.

NODE=M071240

NODE=M071240

NODE=M071250

NODE=M071QAR
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NODE=M071QAR;LINKAGE=AR

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NODE=M071QBR

NODE=M071QBR;LINKAGE=AR

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REFID=51655

ANDREOTTI	07	PL B654 74	M. Andreotti <i>et al.</i>	(Femilab E835 Collab.)	REFID=51944
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51908
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52049
Also		PR D77 119902E (errat.)	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52266
AUBERT	07BD	PR D76 092006	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52050
PDG	07	Unofficial 2007 WWW edition		(PDC Collab.)	REFID=52717;ERROR=1
PEDLAR	07	PR D75 011102	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)	REFID=51630
ABLIKIM	06G	PR D73 052004	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51048
ABLIKIM	06I	PR D74 012004	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51126
ABLIKIM	06L	PRL 97 121801	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51129
ABLIKIM	06R	PR D74 072001	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51447
ABLIKIM	06W	PR D74 112003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51560
ADAM	06	PRL 96 082004	N.E. Adam <i>et al.</i>	(CLEO Collab.)	REFID=50989
AUBERT	06B	PR D73 012005	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51026
AUBERT	06D	PR D73 052003	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51047
AUBERT,BE	06D	PR D74 091103	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51511
DOBBS	06A	PR D74 011105	S. Dobbs <i>et al.</i>	(CLEO Collab.)	REFID=51158
ABLIKIM	05E	PR D71 072006	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50757
ABLIKIM	05H	PR D72 012002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50759
ABLIKIM	05I	PL B614 37	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50758
ABLIKIM	05J	PL B619 247	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50760
ABLIKIM	05O	PL B630 21	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50846
ADAM	05	PRL 94 012005	N.E. Adam <i>et al.</i>	(CLEO Collab.)	REFID=50451
ADAM	05A	PRL 94 232002	N.E. Adam <i>et al.</i>	(CLEO Collab.)	REFID=50763
ANDREOTTI	05	PR D71 032006	M. Andreotti <i>et al.</i>	(FNAL E835 Collab.)	REFID=50497
AUBERT	05D	PR D71 052001	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50509
BRIERE	05	PRL 95 062001	R.A. Briere <i>et al.</i>	(CLEO Collab.)	REFID=50785
PEDLAR	05	PR D72 051108	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)	REFID=50808
ROSNER	05	PRL 95 102003	J.L. Rosner <i>et al.</i>	(CLEO Collab.)	REFID=50812
ABLIKIM	04B	PR D70 012003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=49741
ABLIKIM	04K	PR D70 112003	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50327
ABLIKIM	04L	PR D70 112007	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50328
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=50331
BAI	04B	PRL 92 052001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49608
BAI	04C	PR D69 072001	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49749
BAI	04D	PL B589 7	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49750
BAI	04G	PR D70 012004	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49753
BAI	04I	PR D70 012006	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49755
PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)	REFID=49653
SETH	04	PR D69 097503	K.K. Seth		REFID=49779
AULCHENKO	03	PL B573 63	V.M. Aulchenko <i>et al.</i>		REFID=49579
BAI	03B	PR D67 052002	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49186
BAI	03C	PR D67 032004	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49190
AUBERT	02B	PR D65 031101	B. Aubert <i>et al.</i>	(BaBar Collab.)	REFID=48548
BAI	02	PR D65 052004	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=48578
BAI	02B	PL B550 24	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=49171
BAI	02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50506
PDG	02	PR D66 010001	K. Hagiwara <i>et al.</i>		REFID=48632
BAI	01	PR D63 032002	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=48003
AMBROGIANI	00A	PR D62 032004	M. Ambrogiani <i>et al.</i>	(FNAL E835 Collab.)	REFID=47939
ARTAMONOV	00	PL B474 427	S. Artamonov <i>et al.</i>		REFID=47424
BAI	00	PRL 84 594	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50503
BAI	99C	PRL 83 1918	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=47420
BAI	99E	PR D57 3854	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46339
BAI	99F	PR D58 097101	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46340
BAI	99J	PRL 81 5080	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46554
ARMSTRONG	97	PR D55 1153	T.A. Armstrong <i>et al.</i>	(E760 Collab.)	REFID=45416
GРИБУШИН	96	PR D53 4723	A. Gribushin <i>et al.</i>	(E672 Collab., E706 Collab.)	REFID=44739
ARMSTRONG	93B	PR D47 772	T.A. Armstrong <i>et al.</i>	(FNAL E760 Collab.)	REFID=43307
ALEXANDER	89	NP B320 45	J.P. Alexander <i>et al.</i>	(LBL, MICH, SLAC)	REFID=40345
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)	REFID=11616
GAISER	86	PR D34 711	J. Gaisser <i>et al.</i>	(Crystal Ball Collab.)	REFID=22012
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)	REFID=40033
		Translated from YAF 41 733.			
FRANKLIN	83	PRL 51 963	M.E.B. Franklin <i>et al.</i>	(LBL, SLAC)	REFID=22216
EDWARDS	82C	PRL 48 70	C. Edwards <i>et al.</i>	(CIT, HARV, PRIN+)	REFID=22173
LEMOIGNE	82	PL 113B 509	Y. Lemoigne <i>et al.</i>	(SACL, LOIC, SHMP+)	REFID=22084
HIMEL	80	PRl 44 920	T. Himel <i>et al.</i>	(LBL, SLAC)	REFID=22119
OREGLIA	80	PRL 45 959	M.J. Oreglia <i>et al.</i>	(SLAC, CIT, HARV+)	REFID=22207
SCHARRE	80	PL 97B 329	D.L. Scharre <i>et al.</i>	(SLAC, LBL)	REFID=21329
ZHOLENTZ	80	PL 96B 214	A.A. Zholents <i>et al.</i>	(NOVO)	REFID=10320
Also		SJNP 34 814	A.A. Zholents <i>et al.</i>	(NOVO)	REFID=10321
		Translated from YAF 34 1471.			
BRANDELIK	79B	NP B160 426	R. Brandelik <i>et al.</i>	(DASP Collab.)	REFID=22115
BRANDELIK	79C	ZPHY C1 233	R. Brandelik <i>et al.</i>	(DASP Collab.)	REFID=22114
BARTEL	78B	PL 79B 492	W. Bartel <i>et al.</i>	(DESY, HEIDP)	REFID=22111
TANENBAUM	78	PR D17 1731	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL)	REFID=22112
BIDDICK	77	PRL 38 1324	C.J. Biddick <i>et al.</i>	(UCSD, UMD, PAVI+)	REFID=22059
BRAUNSCH...	77	PL 67B 249	W. Braunschweig <i>et al.</i>	(DASP Collab.)	REFID=22197
BURMESTER	77	PL 66B 395	J. Burmester <i>et al.</i>	(DESY, HAMB, SIEG+)	REFID=22198
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)	REFID=22062
YAMADA	77	Hamburg Conf. 69	S. Yamada	(DASP Collab.)	REFID=22064
BARTEL	76	PL 64B 483	W. Bartel <i>et al.</i>	(DESY, HEIDP)	REFID=22192
TANENBAUM	76	PRL 36 402	W.M. Tanenbaum <i>et al.</i>	(SLAC, LBL) IG	REFID=22194
WHITAKER	76	PRL 37 1596	J.S. Whitaker <i>et al.</i>	(SLAC, LBL)	REFID=22151
ABRAMS	75	Stanford Symp. 25	G.S. Abrams	(LBL)	REFID=22176
ABRAMS	75B	PRL 34 1181	G.S. Abrams <i>et al.</i>	(LBL, SLAC)	REFID=22177
BOYARSKI	75C	Palermo Conf. 54	A.M. Boyarski <i>et al.</i>	(SLAC, LBL)	REFID=22179
HILGER	75	PRL 35 625	E. Hilger <i>et al.</i>	(STAN, PENN)	REFID=22186
LIBERMAN	75	Stanford Symp. 55	A.D. Liberman	(STAN)	REFID=22046
LUTH	75	PRL 35 1124	V. Luth <i>et al.</i>	(SLAC, LBL) JPC	REFID=22188
WIJK	75	Stanford Symp. 69	B.H. Wiik	(DESY)	REFID=22050

$\psi(3770)$ $I^G(J^{PC}) = 0^-(1^- -)$

NODE=M053

 $\psi(3770)$ MASS (MeV)

OUR FIT includes measurements of $m_{\psi}(2S)$, $m_{\psi}(3770)$, and $m_{\psi}(3770) - m_{\psi}(2S)$.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	------	-------------	------	---------

 3773.15 ± 0.33 OUR FIT **3778.1 ± 1.2 OUR AVERAGE**

3779.2	$+1.8$ -1.7	$+0.6$ -0.8	¹ ANASHIN	12A KEDR	$e^+ e^- \rightarrow D\bar{D}$
3775.5	± 2.4	± 0.5	57	AUBERT	$08B BABR$
3776	± 5	± 4	68	BRODZICKA	$08 BELL$
3778.8	± 1.9	± 0.9		AUBERT	$07BE BABR$

• • • We do not use the following data for averages, fits, limits, etc. • • •

3772.0	± 1.9	^{2,3} ABLIKIM	08D BES2	$e^+ e^- \rightarrow$ hadrons
3778.4	± 3.0	± 1.3	34	CHISTOV

¹ Taking into account interference between the resonant and non-resonant $D\bar{D}$ production.

² Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = 0^\circ$.

³ Interference between the resonant and non-resonant $D\bar{D}$ production not taken into account.

NODE=M053M

NODE=M053M

NODE=M053M

 $m_{\psi}(3770) - m_{\psi}(2S)$

OUR FIT includes measurements of $m_{\psi}(2S)$, $m_{\psi}(3770)$, and $m_{\psi}(3770) - m_{\psi}(2S)$.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

 87.04 ± 0.33 OUR FIT **86.6 ± 0.7 OUR AVERAGE** Error includes scale factor of 2.0. See the ideogram below.

86.9	± 0.4	⁴ ABLIKIM	07E BES2	$e^+ e^- \rightarrow$ hadrons
86.7	± 0.7	ABLIKIM	06L BES2	$e^+ e^- \rightarrow$ hadrons
80	± 2	SCHINDLER	80 MRK2	$e^+ e^-$
86	± 2	⁵ BACINO	78 DLCO	$e^+ e^-$
88	± 3	RAPIDIS	77 LGW	$e^+ e^-$

⁴ BES-II $\psi(2S)$ mass subtracted (see ABLIKIM 06L).

⁵ SPEAR $\psi(2S)$ mass subtracted (see SCHINDLER 80).

NODE=M053M;LINKAGE=AN

NODE=M053M;LINKAGE=AB

NODE=M053M;LINKAGE=NI

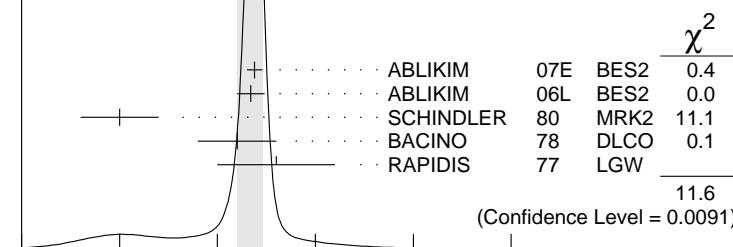
NODE=M053DM

NODE=M053DM

NODE=M053DM

WEIGHTED AVERAGE
 86.6 ± 0.7 (Error scaled by 2.0)

Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

 $m_{\psi}(3770) - m_{\psi}(2S)$ (MeV)

NODE=M053DM;LINKAGE=AK

NODE=M053DM;LINKAGE=S

$\psi(3770)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
27.2± 1.0 OUR FIT					NODE=M053W
27.5± 0.9 OUR AVERAGE					NODE=M053W
24.9 ^{+ 4.6+0.5} _{- 4.0-1.1}		6 ANASHIN	12A KEDR	$e^+ e^- \rightarrow D\bar{D}$	
30.4± 8.5		7,8 ABLIKIM	08D BES2	$e^+ e^- \rightarrow \text{hadrons}$	
27 ±10 ±5	68	BRODZICKA	08 BELL	$B^+ \rightarrow D^0 \bar{D}^0 K^+$	
28.5± 1.2±0.2		8 ABLIKIM	07E BES2	$e^+ e^- \rightarrow \text{hadrons}$	
23.5± 3.7±0.9		AUBERT	07BE BABR	$e^+ e^- \rightarrow D\bar{D}\gamma$	
26.9± 2.4±0.3		8 ABLIKIM	06L BES2	$e^+ e^- \rightarrow \text{hadrons}$	
24 ± 5		8 SCHINDLER	80 MRK2	$e^+ e^-$	
24 ± 5		8 BACINO	78 DLCO	$e^+ e^-$	
28 ± 5		8 RAPIDIS	77 LGW	$e^+ e^-$	
⁶ Taking into account interference between the resonant and non-resonant $D\bar{D}$ production.					
⁷ Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = 0^\circ$.					
⁸ Interference between the resonant and non-resonant $D\bar{D}$ production not taken into account.					

$\psi(3770)$ DECAY MODES

In addition to the dominant decay mode to $D\bar{D}$, $\psi(3770)$ was found to decay into the final states containing the J/ψ (BAI 05, ADAM 06). ADAMS 06 and HUANG 06A searched for various decay modes with light hadrons and found a statistically significant signal for the decay to $\phi\eta$ only (ADAMS 06).

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
$\Gamma_1 D\bar{D}$	(93 ± 8) %	S=2.0	DESIG=2
$\Gamma_2 D^0\bar{D}^0$	(52 ± 5) %	S=2.0	DESIG=5
$\Gamma_3 D^+D^-$	(41 ± 4) %	S=2.0	DESIG=6
$\Gamma_4 J/\psi\pi^+\pi^-$	(1.93±0.28) $\times 10^{-3}$		DESIG=4
$\Gamma_5 J/\psi\pi^0\pi^0$	(8.0 ±3.0) $\times 10^{-4}$		DESIG=46
$\Gamma_6 J/\psi\eta$	(9 ±4) $\times 10^{-4}$		DESIG=47
$\Gamma_7 J/\psi\pi^0$	< 2.8 $\times 10^{-4}$	CL=90%	DESIG=48
$\Gamma_8 e^+e^-$	(9.6 ±0.7) $\times 10^{-6}$	S=1.3	DESIG=1
Decays to light hadrons			
$\Gamma_9 b_1(1235)\pi$	< 1.4 $\times 10^{-5}$	CL=90%	NODE=M053;CLUMP=H
$\Gamma_{10} \phi\eta'$	< 7 $\times 10^{-4}$	CL=90%	DESIG=20
$\Gamma_{11} \omega\eta'$	< 4 $\times 10^{-4}$	CL=90%	DESIG=17
$\Gamma_{12} \rho^0\eta'$	< 6 $\times 10^{-4}$	CL=90%	DESIG=16
$\Gamma_{13} \phi\eta$	(3.1 ±0.7) $\times 10^{-4}$		DESIG=15
$\Gamma_{14} \omega\eta$	< 1.4 $\times 10^{-5}$	CL=90%	DESIG=8
$\Gamma_{15} \rho^0\eta$	< 5 $\times 10^{-4}$	CL=90%	DESIG=14
$\Gamma_{16} \phi\pi^0$	< 3 $\times 10^{-5}$	CL=90%	DESIG=13
$\Gamma_{17} \omega\pi^0$	< 6 $\times 10^{-4}$	CL=90%	DESIG=12
$\Gamma_{18} \pi^+\pi^-\pi^0$	< 5 $\times 10^{-6}$	CL=90%	DESIG=11
$\Gamma_{19} \rho\pi$	< 5 $\times 10^{-6}$	CL=90%	DESIG=9
$\Gamma_{20} K^*(892)^+K^- + \text{c.c.}$	< 1.4 $\times 10^{-5}$	CL=90%	DESIG=10
$\Gamma_{21} K^*(892)^0\bar{K}^0 + \text{c.c.}$	< 1.2 $\times 10^{-3}$	CL=90%	DESIG=19
$\Gamma_{22} K_S^0 K_L^0$	< 1.2 $\times 10^{-5}$	CL=90%	DESIG=18
$\Gamma_{23} 2(\pi^+\pi^-)$	< 1.12 $\times 10^{-3}$	CL=90%	DESIG=3
$\Gamma_{24} 2(\pi^+\pi^-)\pi^0$	< 1.06 $\times 10^{-3}$	CL=90%	DESIG=21
$\Gamma_{25} 2(\pi^+\pi^-\pi^0)$	< 5.85 %	CL=90%	DESIG=22
$\Gamma_{26} \omega\pi^+\pi^-$	< 6.0 $\times 10^{-4}$	CL=90%	DESIG=208
$\Gamma_{27} 3(\pi^+\pi^-)$	< 9.1 $\times 10^{-3}$		DESIG=24
$\Gamma_{28} 3(\pi^+\pi^-)\pi^0$	< 1.37 %		DESIG=52
$\Gamma_{29} 3(\pi^+\pi^-)2\pi^0$	< 11.74 %	CL=90%	DESIG=55
$\Gamma_{30} \eta\pi^+\pi^-$	< 1.24 $\times 10^{-3}$	CL=90%	DESIG=210
$\Gamma_{31} \pi^+\pi^-2\pi^0$	< 8.9 $\times 10^{-3}$	CL=90%	DESIG=23

Γ_{32}	$\rho^0 \pi^+ \pi^-$	< 6.9	$\times 10^{-3}$	CL=90%	DESIG=64
Γ_{33}	$\eta 3\pi$	< 1.34	$\times 10^{-3}$	CL=90%	DESIG=25
Γ_{34}	$\eta 2(\pi^+ \pi^-)$	< 2.43	%		DESIG=53
Γ_{35}	$\eta \rho^0 \pi^+ \pi^-$	< 1.45	%	CL=90%	DESIG=221
Γ_{36}	$\eta' 3\pi$	< 2.44	$\times 10^{-3}$	CL=90%	DESIG=26
Γ_{37}	$K^+ K^- \pi^+ \pi^-$	< 9.0	$\times 10^{-4}$	CL=90%	DESIG=27
Γ_{38}	$\phi \pi^+ \pi^-$	< 4.1	$\times 10^{-4}$	CL=90%	DESIG=28
Γ_{39}	$K^+ K^- 2\pi^0$	< 4.2	$\times 10^{-3}$	CL=90%	DESIG=207
Γ_{40}	$4(\pi^+ \pi^-)$	< 1.67	%	CL=90%	DESIG=62
Γ_{41}	$4(\pi^+ \pi^-)\pi^0$	< 3.06	%	CL=90%	DESIG=63
Γ_{42}	$\phi f_0(980)$	< 4.5	$\times 10^{-4}$	CL=90%	DESIG=29
Γ_{43}	$K^+ K^- \pi^+ \pi^- \pi^0$	< 2.36	$\times 10^{-3}$	CL=90%	DESIG=30
Γ_{44}	$K^+ K^- \rho^0 \pi^0$	< 8	$\times 10^{-4}$	CL=90%	DESIG=67
Γ_{45}	$K^+ K^- \rho^+ \pi^-$	< 1.46	%	CL=90%	DESIG=68
Γ_{46}	$\omega K^+ K^-$	< 3.4	$\times 10^{-4}$	CL=90%	DESIG=32
Γ_{47}	$\phi \pi^+ \pi^- \pi^0$	< 3.8	$\times 10^{-3}$	CL=90%	DESIG=69
Γ_{48}	$K^{*0} K^- \pi^+ \pi^0 + \text{c.c.}$	< 1.62	%	CL=90%	DESIG=70
Γ_{49}	$K^{*+} K^- \pi^+ \pi^- + \text{c.c.}$	< 3.23	%	CL=90%	DESIG=71
Γ_{50}	$K^+ K^- \pi^+ \pi^- 2\pi^0$	< 2.67	%	CL=90%	DESIG=209
Γ_{51}	$K^+ K^- 2(\pi^+ \pi^-)$	< 1.03	%	CL=90%	DESIG=57
Γ_{52}	$K^+ K^- 2(\pi^+ \pi^-)\pi^0$	< 3.60	%	CL=90%	DESIG=58
Γ_{53}	$\eta K^+ K^-$	< 4.1	$\times 10^{-4}$	CL=90%	DESIG=31
Γ_{54}	$\eta K^+ K^- \pi^+ \pi^-$	< 1.24	%	CL=90%	DESIG=222
Γ_{55}	$\rho^0 K^+ K^-$	< 5.0	$\times 10^{-3}$	CL=90%	DESIG=65
Γ_{56}	$2(K^+ K^-)$	< 6.0	$\times 10^{-4}$	CL=90%	DESIG=33
Γ_{57}	$\phi K^+ K^-$	< 7.5	$\times 10^{-4}$	CL=90%	DESIG=34
Γ_{58}	$2(K^+ K^-)\pi^0$	< 2.9	$\times 10^{-4}$	CL=90%	DESIG=35
Γ_{59}	$2(K^+ K^-)\pi^+ \pi^-$	< 3.2	$\times 10^{-3}$	CL=90%	DESIG=59
Γ_{60}	$K_S^0 K^- \pi^+$	< 3.2	$\times 10^{-3}$	CL=90%	DESIG=200
Γ_{61}	$K_S^0 K^- \pi^+ \pi^0$	< 1.33	%	CL=90%	DESIG=201
Γ_{62}	$K_S^0 K^- \rho^+$	< 6.6	$\times 10^{-3}$	CL=90%	DESIG=214
Γ_{63}	$K_S^0 K^- 2\pi^+ \pi^-$	< 8.7	$\times 10^{-3}$	CL=90%	DESIG=202
Γ_{64}	$K_S^0 K^- \pi^+ \rho^0$	< 1.6	%	CL=90%	DESIG=215
Γ_{65}	$K_S^0 K^- \pi^+ \eta$	< 1.3	%	CL=90%	DESIG=216
Γ_{66}	$K_S^0 K^- 2\pi^+ \pi^- \pi^0$	< 4.18	%	CL=90%	DESIG=203
Γ_{67}	$K_S^0 K^- 2\pi^+ \pi^- \eta$	< 4.8	%	CL=90%	DESIG=217
Γ_{68}	$K_S^0 K^- \pi^+ 2(\pi^+ \pi^-)$	< 1.22	%	CL=90%	DESIG=204
Γ_{69}	$K_S^0 K^- \pi^+ 2\pi^0$	< 2.65	%	CL=90%	DESIG=205
Γ_{70}	$K_S^0 K^- K^+ K^- \pi^+$	< 4.9	$\times 10^{-3}$	CL=90%	DESIG=218
Γ_{71}	$K_S^0 K^- K^+ K^- \pi^+ \pi^0$	< 3.0	%	CL=90%	DESIG=219
Γ_{72}	$K_S^0 K^- K^+ K^- \pi^+ \eta$	< 2.2	%	CL=90%	DESIG=220
Γ_{73}	$K^{*0} K^- \pi^+ + \text{c.c.}$	< 9.7	$\times 10^{-3}$	CL=90%	DESIG=60
Γ_{74}	$p\bar{p}\pi^0$	< 1.2	$\times 10^{-3}$		DESIG=54
Γ_{75}	$p\bar{p}\pi^+ \pi^-$	< 5.8	$\times 10^{-4}$	CL=90%	DESIG=36
Γ_{76}	$\Lambda\bar{\Lambda}$	< 1.2	$\times 10^{-4}$	CL=90%	DESIG=42
Γ_{77}	$p\bar{p}\pi^+ \pi^- \pi^0$	< 1.85	$\times 10^{-3}$	CL=90%	DESIG=37
Γ_{78}	$\omega p\bar{p}$	< 2.9	$\times 10^{-4}$	CL=90%	DESIG=39
Γ_{79}	$\Lambda\bar{\Lambda}\pi^0$	< 1.2	$\times 10^{-3}$	CL=90%	DESIG=72
Γ_{80}	$p\bar{p}2(\pi^+ \pi^-)$	< 2.6	$\times 10^{-3}$	CL=90%	DESIG=61
Γ_{81}	$\eta p\bar{p}$	< 5.4	$\times 10^{-4}$	CL=90%	DESIG=38
Γ_{82}	$\eta p\bar{p}\pi^+ \pi^-$	< 3.3	$\times 10^{-3}$	CL=90%	DESIG=223
Γ_{83}	$\rho^0 p\bar{p}$	< 1.7	$\times 10^{-3}$	CL=90%	DESIG=66
Γ_{84}	$p\bar{p}K^+ K^-$	< 3.2	$\times 10^{-4}$	CL=90%	DESIG=40
Γ_{85}	$\eta p\bar{p}K^+ K^-$	< 6.9	$\times 10^{-3}$	CL=90%	DESIG=224
Γ_{86}	$\pi^0 p\bar{p}K^+ K^-$	< 1.2	$\times 10^{-3}$	CL=90%	DESIG=225
Γ_{87}	$\phi p\bar{p}$	< 1.3	$\times 10^{-4}$	CL=90%	DESIG=41
Γ_{88}	$\Lambda\bar{\Lambda}\pi^+ \pi^-$	< 2.5	$\times 10^{-4}$	CL=90%	DESIG=43
Γ_{89}	$\Lambda\bar{p}K^+$	< 2.8	$\times 10^{-4}$	CL=90%	DESIG=44
Γ_{90}	$\Lambda\bar{p}K^+ \pi^+ \pi^-$	< 6.3	$\times 10^{-4}$	CL=90%	DESIG=45

Radiative decays

Γ_{91}	$\gamma\chi_{c2}$	< 9	$\times 10^{-4}$	CL=90%
Γ_{92}	$\gamma\chi_{c1}$	(2.9 \pm 0.6)	$\times 10^{-3}$	DESIG=51
Γ_{93}	$\gamma\chi_{c0}$	(7.3 \pm 0.9)	$\times 10^{-3}$	DESIG=50
Γ_{94}	$\gamma\eta'$	< 1.8	$\times 10^{-4}$	DESIG=49
Γ_{95}	$\gamma\eta$	< 1.5	$\times 10^{-4}$	DESIG=213
Γ_{96}	$\gamma\pi^0$	< 2	$\times 10^{-4}$	DESIG=212
				DESIG=211

NODE=M053;CLUMP=R
 DESIG=51
 DESIG=50
 DESIG=49
 DESIG=213
 DESIG=212
 DESIG=211

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and 3 branching ratios uses 23 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 20.0$ for 19 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{|ccc|} \hline & 98 & \\ x_3 & 0 & 0 \\ x_8 & 0 & -44 \\ \hline \Gamma & 0 & 0 \\ & x_2 & x_3 & x_8 \\ \hline \end{array}$$

Mode	Rate (MeV)	Scale factor	
$\Gamma_2 D^0 \bar{D}^0$	14.1 \pm 1.4	1.7	DESIG=5
$\Gamma_3 D^+ D^-$	11.2 \pm 1.1	1.7	DESIG=6
$\Gamma_8 e^+ e^-$	(2.62 \pm 0.18) $\times 10^{-4}$	1.4	DESIG=1

 $\psi(3770)$ PARTIAL WIDTHS **$\Gamma(e^+ e^-)$**

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
-------------	------	-------------	------	---------

0.262 \pm 0.018 OUR FIT Error includes scale factor of 1.4.

0.256 \pm 0.016 OUR AVERAGE Error includes scale factor of 1.2.

$0.154^{+0.079+0.021}_{-0.058-0.027}$	9,10	ANASHIN	12A	KEDR	$e^+ e^- \rightarrow D\bar{D}$
0.22 \pm 0.05	11,12	ABLIKIM	08D	BES2	$e^+ e^- \rightarrow \text{hadrons}$
$0.277 \pm 0.011 \pm 0.013$	12	ABLIKIM	07E	BES2	$e^+ e^- \rightarrow \text{hadrons}$
$0.203 \pm 0.003^{+0.041}_{-0.027}$	1.4M	12,13 BESSON	06	CLEO	$e^+ e^- \rightarrow \text{hadrons}$
0.276 \pm 0.050	12	SCHINDLER	80	MRK2	$e^+ e^-$
0.18 \pm 0.06	12	BACINO	78	DLCO	$e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.414 \pm 0.072 \pm 0.093	10,14	ANASHIN	12A	KEDR	$e^+ e^- \rightarrow D\bar{D}$
0.37 \pm 0.09	15	RAPIDIS	77	LGW	$e^+ e^-$

 Γ_8

NODE=M053225

NODE=M053W1
 NODE=M053W1

- ⁹ Solution I of the two solutions.
¹⁰ Taking into account interference between the resonant and non-resonant $D\bar{D}$ production.
¹¹ Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = 0^\circ$.
¹² Interference between the resonant and non-resonant $D\bar{D}$ production not taken into account.
¹³ BESSON 06 (as corrected in BESSON 10) measure $\sigma(e^+ e^- \rightarrow \psi(3770) \rightarrow \text{hadrons}) = 6.36 \pm 0.08^{+0.41}_{-0.30}$ nb at $\sqrt{s} = 3773 \pm 1$ MeV, and obtain Γ_{ee} from the Born-level cross section calculated using $\psi(3770)$ mass and width from our 2004 edition, PDG 04.
¹⁴ Solution II of the two solutions.
¹⁵ See also $\Gamma(e^+ e^-)/\Gamma_{\text{total}}$ below.

OCCUR=2

NODE=M053W1;LINKAGE=A1
 NODE=M053W1;LINKAGE=AN
 NODE=M053W1;LINKAGE=AB

NODE=M053W1;LINKAGE=NI

NODE=M053W1;LINKAGE=BE

NODE=M053W1;LINKAGE=A2
 NODE=M053W1;LINKAGE=R

$\psi(3770)$ BRANCHING RATIOS

$\Gamma(D\bar{D})/\Gamma_{\text{total}}$	$\Gamma_1/\Gamma = (\Gamma_2 + \Gamma_3)/\Gamma$
<u>VALUE</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.93 ± 0.08 OUR FIT	Error includes scale factor of 2.0.
0.93 ± 0.08 OUR AVERAGE	Error includes scale factor of 2.1.
$0.849 \pm 0.056 \pm 0.018$	16 ABLIKIM 08B BES2 $e^+ e^- \rightarrow \text{non-}D\bar{D}$
$1.033 \pm 0.014^{+0.048}_{-0.066}$	1.427M 17 BESSON 06 CLEO $e^+ e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
$0.866 \pm 0.050 \pm 0.036$	18,19 ABLIKIM 07K BES2 $e^+ e^- \rightarrow \text{non-}D\bar{D}$
$0.836 \pm 0.073 \pm 0.042$	19 ABLIKIM 06L BES2 $e^+ e^- \rightarrow D\bar{D}$
$0.855 \pm 0.017 \pm 0.058$	19,20 ABLIKIM 06N BES2 $e^+ e^- \rightarrow D\bar{D}$
$\Gamma(D^0\bar{D}^0)/\Gamma_{\text{total}}$	Γ_2/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.52 ± 0.05 OUR FIT	Error includes scale factor of 2.0.
• • • We do not use the following data for averages, fits, limits, etc. • • •	
$0.467 \pm 0.047 \pm 0.023$	ABLIKIM 06L BES2 $e^+ e^- \rightarrow D^0\bar{D}^0$
$0.499 \pm 0.013 \pm 0.038$	20 ABLIKIM 06N BES2 $e^+ e^- \rightarrow D^0\bar{D}^0$
$\Gamma(D^+\bar{D}^-)/\Gamma_{\text{total}}$	Γ_3/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.41 ± 0.04 OUR FIT	Error includes scale factor of 2.0.
• • • We do not use the following data for averages, fits, limits, etc. • • •	
$0.369 \pm 0.037 \pm 0.028$	ABLIKIM 06L BES2 $e^+ e^- \rightarrow D^+ D^-$
$0.357 \pm 0.011 \pm 0.034$	20 ABLIKIM 06N BES2 $e^+ e^- \rightarrow D^+ D^-$
$\Gamma(D^0\bar{D}^0)/\Gamma(D^+\bar{D}^-)$	Γ_2/Γ_3
<u>VALUE</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
1.260 ± 0.021 OUR FIT	
1.260 ± 0.021 OUR AVERAGE	
$1.39 \pm 0.31 \pm 0.12$	PAKHLOVA 08 BELL $10.6 e^+ e^- \rightarrow D\bar{D}\gamma$
$1.78 \pm 0.33 \pm 0.24$	AUBERT 07BE BABR $e^+ e^- \rightarrow D\bar{D}\gamma$
$1.258 \pm 0.016 \pm 0.014$	DOBBS 07 CLEO $e^+ e^- \rightarrow D\bar{D}$
$1.27 \pm 0.12 \pm 0.08$	ABLIKIM 06L BES2 $e^+ e^- \rightarrow D\bar{D}$
$2.43 \pm 1.50 \pm 0.43$	34 21 CHISTOV 04 BELL $B^+ \rightarrow \psi(3770) K^+$
$\Gamma(J/\psi\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_4/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
1.93 ± 0.28 OUR AVERAGE	
$1.89 \pm 0.20 \pm 0.20$	231 \pm 33 ADAM 06 CLEO $e^+ e^- \rightarrow \psi(3770)$
$3.4 \pm 1.4 \pm 0.9$	17.8 \pm 4.8 BAI 05 BES2 $e^+ e^- \rightarrow \psi(3770)$
$\Gamma(J/\psi\pi^0\pi^0)/\Gamma_{\text{total}}$	Γ_5/Γ
<u>VALUE (units 10^{-2})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.080 $\pm 0.025 \pm 0.016$	39 \pm 14 ADAM 06 CLEO $e^+ e^- \rightarrow \psi(3770)$
$\Gamma(J/\psi\eta)/\Gamma_{\text{total}}$	Γ_6/Γ
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
87 \pm 33 \pm 22	22 \pm 10 ADAM 06 CLEO $e^+ e^- \rightarrow \psi(3770)$
$\Gamma(J/\psi\pi^0)/\Gamma_{\text{total}}$	Γ_7/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u> <u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<28	90 <10 ADAM 06 CLEO $e^+ e^- \rightarrow \psi(3770)$
$\Gamma(e^+e^-)/\Gamma_{\text{total}}$	Γ_8/Γ
<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.96 ± 0.07 OUR FIT	Error includes scale factor of 1.3.
1.3 ± 0.2	RAPIDIS 77 LGW $e^+ e^-$

NODE=M053230

NODE=M053R1

NODE=M053R1

NODE=M053R46

NODE=M053R46

NODE=M053R47

NODE=M053R47

NODE=M053R5

NODE=M053R5

NODE=M053R4

NODE=M053R4

NODE=M053R7

NODE=M053R7

NODE=M053R8

NODE=M053R8

NODE=M053R9

NODE=M053R9

NODE=M053R2

NODE=M053R2

- 16 Neglecting interference.
 17 Obtained by comparing a measurement of the total cross section (corrected in BESSON 10) with that of $D\bar{D}$ reported by CLEO in DOBBS 07.
 18 Using $\sigma^{obs} = 7.07 \pm 0.58$ nb and neglecting interference.
 19 Not independent of ABLIKIM 08B.
 20 From a measurement of $\sigma(e^+ e^- \rightarrow D\bar{D})$ at $\sqrt{s} = 3773$ MeV, using the $\psi(3770)$ resonance parameters measured by ABLIKIM 06L.
 21 See ADLER 88C for older measurements of this quantity.

DECAYS TO LIGHT HADRONS

 $\Gamma(b_1(1235)\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_9/Γ
<1.4	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\phi\eta')/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{10}/Γ
<7	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\omega\eta')/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ
<4	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\rho^0\eta')/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
<6	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\phi\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
3.1±0.6±0.3		22 ADAMS 06	CLEO	$3.773 e^+ e^- \rightarrow \phi\eta$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<19		23 ABLIKIM 07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
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 $\Gamma(\omega\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{14}/Γ
<1.4	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\rho^0\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{15}/Γ
<5	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\phi\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{16}/Γ
< 3	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<50		23 ABLIKIM 07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
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 $\Gamma(\omega\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{17}/Γ
<6	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{18}/Γ
<5	90	22,24 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(\rho\pi)/\Gamma_{\text{total}}$

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{19}/Γ
<5	90	22,24 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

 $\Gamma(K^*(892)^+ K^- + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{20}/Γ
<1.4	90	22 ADAMS 06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R1;LINKAGE=AI

NODE=M053R1;LINKAGE=BE

NODE=M053R1;LINKAGE=AL

NODE=M053R1;LINKAGE=SU

NODE=M053R;LINKAGE=AB

NODE=M053R5;LINKAGE=CH

NODE=M053250

NODE=M053R82

NODE=M053R82

NODE=M053R83

NODE=M053R83

NODE=M053R84

NODE=M053R84

NODE=M053R85

NODE=M053R85

NODE=M053R6

NODE=M053R6

NODE=M053R86

NODE=M053R86

NODE=M053R87

NODE=M053R87

NODE=M053R11

NODE=M053R11

NODE=M053R88

NODE=M053R88

NODE=M053R89

NODE=M053R89

NODE=M053R90

NODE=M053R90

NODE=M053R91

NODE=M053R91

$\Gamma(K^*(892)^0 \bar{K}^0 + \text{c.c.})/\Gamma_{\text{total}}$					Γ_{21}/Γ	NODE=M053R92 NODE=M053R92
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.2	90		22 ADAMS	06	CLEO	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(K_S^0 K_L^0)/\Gamma_{\text{total}}$					Γ_{22}/Γ	NODE=M053R3 NODE=M053R3
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 1.2	90		25 CRONIN-HEN..06	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<21	90		26 ABLIKIM	04F	BES	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(2(\pi^+ \pi^-))/\Gamma_{\text{total}}$					Γ_{23}/Γ	NODE=M053R21 NODE=M053R21
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<11.2	90		27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<48			23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(2(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$					Γ_{24}/Γ	NODE=M053R22 NODE=M053R22
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<10.6	90	305	ABLIKIM	08N	BES2	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<62			23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(2(\pi^+ \pi^- \pi^0))/\Gamma_{\text{total}}$					Γ_{25}/Γ	NODE=M053R72 NODE=M053R72
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<58.5	90	305	ABLIKIM	08N	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\omega \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{26}/Γ	NODE=M053R24 NODE=M053R24
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 6.0	90		27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<55	90		23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$
$\Gamma(3(\pi^+ \pi^-))/\Gamma_{\text{total}}$					Γ_{27}/Γ	NODE=M053R07 NODE=M053R07
<u>VALUE (units 10^{-4})</u>			<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<91			23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(3(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$					Γ_{28}/Γ	NODE=M053R10 NODE=M053R10
<u>VALUE (units 10^{-4})</u>			<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<137			23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(3(\pi^+ \pi^-)2\pi^0)/\Gamma_{\text{total}}$					Γ_{29}/Γ	NODE=M053R74 NODE=M053R74
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<117.4	90	59	ABLIKIM	08N	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\eta \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{30}/Γ	NODE=M053R23 NODE=M053R23
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.24	90		27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.3	90		23 ABLIKIM	10D	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\pi^+ \pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_{31}/Γ	NODE=M053R70 NODE=M053R70
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<8.9	90	218	ABLIKIM	08N	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\rho^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{32}/Γ	NODE=M053R53 NODE=M053R53
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<6.9	90		23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\eta 3\pi)/\Gamma_{\text{total}}$					Γ_{33}/Γ	NODE=M053R25 NODE=M053R25
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<13.4	90		27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$

$\Gamma(\eta 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$					Γ_{34}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R08 NODE=M053R08
<243		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(\eta \rho^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{35}/Γ	
<u>VALUE (units 10^{-2})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R77 NODE=M053R77
<1.45	90	23 ABLIKIM	10D	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(\eta' 3\pi)/\Gamma_{\text{total}}$					Γ_{36}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R26 NODE=M053R26
<24.4	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{37}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R27 NODE=M053R27
< 9.0	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
<48		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(\phi \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{38}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R28 NODE=M053R28
< 4.1	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
<16		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K^+ K^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_{39}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R71 NODE=M053R71
<4.2	90	14	ABLIKIM	08N	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(4(\pi^+ \pi^-))/\Gamma_{\text{total}}$					Γ_{40}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R50 NODE=M053R50
<16.7	90	23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(4(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$					Γ_{41}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R52 NODE=M053R52
<30.6	90	23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(\phi f_0(980))/\Gamma_{\text{total}}$					Γ_{42}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R29 NODE=M053R29
<4.5	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$					Γ_{43}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R30 NODE=M053R30
< 23.6	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
<111		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K^+ K^- \rho^0 \pi^0)/\Gamma_{\text{total}}$					Γ_{44}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R58 NODE=M053R58
<8	90	23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$	
$\Gamma(K^+ K^- \rho^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{45}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R59 NODE=M053R59
<146	90	23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$	
$\Gamma(\omega K^+ K^-)/\Gamma_{\text{total}}$					Γ_{46}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		NODE=M053R32 NODE=M053R32
< 3.4	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$						
<66	90	23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$	

$\Gamma(\phi\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$				Γ_{47}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<38	90	23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$
$\Gamma(K^*0 K^- \pi^+ \pi^0 + \text{c.c.})/\Gamma_{\text{total}}$				Γ_{48}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<162	90	23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$
$\Gamma(K^+ K^- \pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$				Γ_{49}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<323	90	23 ABLIKIM	07I	BES2	3.77 $e^+ e^-$
$\Gamma(K^+ K^- \pi^+ \pi^- 2\pi^0)/\Gamma_{\text{total}}$				Γ_{50}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<26.7	90	24	ABLIKIM	08N	BES2 $e^+ e^- \rightarrow \psi(3770)$
$\Gamma(K^+ K^- 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$				Γ_{51}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<10.3	90	23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(K^+ K^- 2(\pi^+ \pi^-)\pi^0)/\Gamma_{\text{total}}$				Γ_{52}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<36.0	90	23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\eta K^+ K^-)/\Gamma_{\text{total}}$				Γ_{53}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 4.1	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<31	90	23 ABLIKIM	10D	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\eta K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$				Γ_{54}/Γ	
<u>VALUE (units 10^{-2})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.24	90	23 ABLIKIM	10D	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\rho^0 K^+ K^-)/\Gamma_{\text{total}}$				Γ_{55}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<5.0	90	23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(2(K^+ K^-))/\Gamma_{\text{total}}$				Γ_{56}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 6.0	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<17		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(\phi K^+ K^-)/\Gamma_{\text{total}}$				Γ_{57}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 7.5	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<24		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(2(K^+ K^-)\pi^0)/\Gamma_{\text{total}}$				Γ_{58}/Γ	
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 2.9	90	27 HUANG	06A	CLEO	$e^+ e^- \rightarrow \psi(3770)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<46		23 ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(2(K^+ K^-)\pi^+ \pi^-)/\Gamma_{\text{total}}$				Γ_{59}/Γ	
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<3.2	90	23 ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$

$\Gamma(K_S^0 K^- \pi^+)/\Gamma_{\text{total}}$			Γ_{60}/Γ			NODE=M053R64 NODE=M053R64	
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT		
<3.2	90	18	ABLIKIM	08M	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- \pi^+ \pi^0)/\Gamma_{\text{total}}$			Γ_{61}/Γ			NODE=M053R65 NODE=M053R65	
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT		
<13.3	90	40	ABLIKIM	08M	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- \rho^+)/\Gamma_{\text{total}}$			Γ_{62}/Γ			NODE=M053R15 NODE=M053R15	
VALUE (units 10^{-3})	CL%		DOCUMENT ID	TECN	COMMENT		
<6.6	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- 2\pi^+ \pi^-)/\Gamma_{\text{total}}$			Γ_{63}/Γ			NODE=M053R66 NODE=M053R66	
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT		
<8.7	90	39	ABLIKIM	08M	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- \pi^+ \rho^0)/\Gamma_{\text{total}}$			Γ_{64}/Γ			NODE=M053R16 NODE=M053R16	
VALUE (units 10^{-2})	CL%		DOCUMENT ID	TECN	COMMENT		
<1.6	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- \pi^+ \eta)/\Gamma_{\text{total}}$			Γ_{65}/Γ			NODE=M053R17 NODE=M053R17	
VALUE (units 10^{-2})	CL%		DOCUMENT ID	TECN	COMMENT		
<1.3	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- 2\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$			Γ_{66}/Γ			NODE=M053R67 NODE=M053R67	
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT		
<41.8	90	23	ABLIKIM	08M	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- 2\pi^+ \pi^- \eta)/\Gamma_{\text{total}}$			Γ_{67}/Γ			NODE=M053R18 NODE=M053R18	
VALUE (units 10^{-2})	CL%		DOCUMENT ID	TECN	COMMENT		
<4.8	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- \pi^+ 2(\pi^+ \pi^-))/\Gamma_{\text{total}}$			Γ_{68}/Γ			NODE=M053R68 NODE=M053R68	
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT		
<12.2	90	4	ABLIKIM	08M	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- \pi^+ 2\pi^0)/\Gamma_{\text{total}}$			Γ_{69}/Γ			NODE=M053R69 NODE=M053R69	
VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT		
<26.5	90	17	ABLIKIM	08M	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- K^+ K^- \pi^+)/\Gamma_{\text{total}}$			Γ_{70}/Γ			NODE=M053R19 NODE=M053R19	
VALUE (units 10^{-3})	CL%		DOCUMENT ID	TECN	COMMENT		
<4.9	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- K^+ K^- \pi^+ \pi^0)/\Gamma_{\text{total}}$			Γ_{71}/Γ			NODE=M053R75 NODE=M053R75	
VALUE (units 10^{-2})	CL%		DOCUMENT ID	TECN	COMMENT		
<3.0	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K_S^0 K^- K^+ K^- \pi^+ \eta)/\Gamma_{\text{total}}$			Γ_{72}/Γ			NODE=M053R76 NODE=M053R76	
VALUE (units 10^{-2})	CL%		DOCUMENT ID	TECN	COMMENT		
<2.2	90		ABLIKIM	09C	BES2	$e^+ e^- \rightarrow \psi(3770)$	
$\Gamma(K^{*0} K^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$			Γ_{73}/Γ			NODE=M053R55 NODE=M053R55	
VALUE (units 10^{-3})	CL%		DOCUMENT ID	TECN	COMMENT		
<9.7	90		23	ABLIKIM	07F	BES2	$e^+ e^- \rightarrow \psi(3770)$
$\Gamma(p\bar{p}\pi^0)/\Gamma_{\text{total}}$			Γ_{74}/Γ			NODE=M053R09 NODE=M053R09	
VALUE (units 10^{-4})			DOCUMENT ID	TECN	COMMENT		
<12			23	ABLIKIM	07B	BES2	$e^+ e^- \rightarrow \psi(3770)$

$\Gamma(p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{75}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 5.8	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<16		23 ABLIKIM	07B BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R36
NODE=M053R36

$\Gamma(\Lambda\bar{\Lambda})/\Gamma_{\text{total}}$					Γ_{76}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.2	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<4	90	23 ABLIKIM	07F BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R42
NODE=M053R42

$\Gamma(p\bar{p}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_{77}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<18.5	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<73		23 ABLIKIM	07B BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R37
NODE=M053R37

$\Gamma(\omega p\bar{p})/\Gamma_{\text{total}}$					Γ_{78}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 2.9	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<30	90	28 ABLIKIM	07I BES2	3.77 $e^+ e^-$	

NODE=M053R39
NODE=M053R39

$\Gamma(\Lambda\bar{\Lambda}\pi^0)/\Gamma_{\text{total}}$					Γ_{79}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<12	90	23 ABLIKIM	07I BES2	3.77 $e^+ e^-$	

NODE=M053R63
NODE=M053R63

$\Gamma(p\bar{p}2(\pi^+\pi^-))/\Gamma_{\text{total}}$					Γ_{80}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2.6	90	23 ABLIKIM	07F BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R49
NODE=M053R49

$\Gamma(\eta p\bar{p})/\Gamma_{\text{total}}$					Γ_{81}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 5.4	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<11	90	23 ABLIKIM	10D BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R38
NODE=M053R38

$\Gamma(\eta p\bar{p}\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{82}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<3.3	90	23 ABLIKIM	10D BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R79
NODE=M053R79

$\Gamma(\rho^0 p\bar{p})/\Gamma_{\text{total}}$					Γ_{83}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.7	90	23 ABLIKIM	07F BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R56
NODE=M053R56

$\Gamma(p\bar{p}K^+K^-)/\Gamma_{\text{total}}$					Γ_{84}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 3.2	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<11		23 ABLIKIM	07B BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R40
NODE=M053R40

$\Gamma(\eta p\bar{p}K^+K^-)/\Gamma_{\text{total}}$					Γ_{85}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<6.9	90	23 ABLIKIM	10D BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R80
NODE=M053R80

$\Gamma(\pi^0 p\bar{p}K^+K^-)/\Gamma_{\text{total}}$					Γ_{86}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.2	90	23 ABLIKIM	10D BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R81
NODE=M053R81

$\Gamma(\phi p\bar{p})/\Gamma_{\text{total}}$					Γ_{87}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.3	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<9		23 ABLIKIM	07B BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R41
NODE=M053R41

$\Gamma(\Lambda\bar{\Lambda}\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{88}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 2.5	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<39	90	23 ABLIKIM	07F BES2	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R43
NODE=M053R43

$\Gamma(\Lambda\bar{p}K^+)/\Gamma_{\text{total}}$					Γ_{89}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2.8	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	

NODE=M053R44
NODE=M053R44

$\Gamma(\Lambda\bar{p}K^+\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{90}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<6.3	90	27 HUANG	06A CLEO	$e^+ e^- \rightarrow \psi(3770)$	
22 Comparing cross sections at $\sqrt{s} = 3.773$ GeV and $\sqrt{s} = 3.671$ GeV, neglecting interference, and using $\sigma(\psi(3770) \rightarrow D\bar{D}) = 6.39 \pm 0.20$ nb.					
23 Assuming that interference effects between resonance and continuum can be neglected and using $\sigma_{\text{obs}}(e^+ e^- \rightarrow \psi(3770)) = 7.15 \pm 0.38$ nb.					
24 Data suggest possible destructive interference with continuum.					
25 Using $\sigma(e^+ e^- \rightarrow \psi(3770) \rightarrow \text{hadrons}) = (6.38 \pm 0.08^{+0.41}_{-0.30})$ nb from BESSON 06 and $B(K_S^0 \rightarrow \pi^+ \pi^-) = 0.6895 \pm 0.0014$.					
26 Using $B(K_S^0 \rightarrow \pi^+ \pi^-) = 0.6860 \pm 0.0027$.					
27 Using $\sigma_{\text{tot}}(e^+ e^- \rightarrow \psi(3770)) = 7.9 \pm 0.6$ nb at the resonance.					
28 Using $\sigma_{\text{obs}} = 7.15 \pm 0.27 \pm 0.27$ nb and neglecting interference.					

NODE=M053R45
NODE=M053R45

RADIATIVE DECAYS

$\Gamma(\gamma\chi_{c2})/\Gamma_{\text{total}}$					Γ_{91}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.9	90	29 COAN	06A CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma\gamma J/\psi$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<2.0	90	30 BRIERE	06 CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma + \text{hadrons}$	

NODE=M053R03
NODE=M053R03

$\Gamma(\gamma\chi_{c1})/\Gamma_{\text{total}}$					Γ_{92}/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2.9±0.5±0.4		31 BRIERE	06 CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma + \text{hadrons}, \gamma\gamma J/\psi$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
3.9±1.4±0.6	54 ± 17	32 BRIERE	06 CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma + \text{hadrons}$	
2.8±0.5±0.4	53 ± 10	29 COAN	06A CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma\gamma J/\psi$	

NODE=M053R02
NODE=M053R02

OCCUR=2

$\Gamma(\gamma\chi_{c1})/\Gamma(J/\psi\pi^+\pi^-)$					Γ_{92}/Γ_4
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.49±0.31±0.26	53 ± 10	33 COAN	06A CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma\gamma J/\psi$	

NODE=M053R04
NODE=M053R04

$\Gamma(\gamma\chi_{c0})/\Gamma_{\text{total}}$					Γ_{93}/Γ
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7.3±0.7±0.6	274 ± 27	34 BRIERE	06 CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma + \text{hadrons}$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
< 44	90	29 COAN	06A CLEO	$e^+ e^- \rightarrow \psi(3770) \rightarrow \gamma\gamma J/\psi$	

NODE=M053R01
NODE=M053R01

$\Gamma(\gamma\chi_{c0})/\Gamma(\gamma\chi_{c2})$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{93}/Γ_{91}
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>8	90	35 BRIERE	06	CLEO $e^+ e^- \rightarrow \psi(3770)$	NODE=M053R06 NODE=M053R06

 $\Gamma(\gamma\chi_{c0})/\Gamma(\gamma\chi_{c1})$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{93}/Γ_{92}
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.5 ± 0.6	35 BRIERE	06	CLEO $e^+ e^- \rightarrow \psi(3770)$	NODE=M053R05 NODE=M053R05

 $\Gamma(\gamma\eta')/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{94}/Γ
<1.8	90	36 PEDLAR	09	CLE3 $\psi(2S) \rightarrow \gamma X$	NODE=M053R14 NODE=M053R14

 $\Gamma(\gamma\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{95}/Γ
<1.5	90	36 PEDLAR	09	CLE3 $\psi(2S) \rightarrow \gamma X$	NODE=M053R13 NODE=M053R13

 $\Gamma(\gamma\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{96}/Γ
<2	90	PEDLAR	09	CLE3 $\psi(2S) \rightarrow \gamma X$	NODE=M053R12 NODE=M053R12

29 Using $\Gamma_{ee}(\psi(2S)) = (2.54 \pm 0.03 \pm 0.11)$ keV from ADAM 06 and taking $\sigma(e^+ e^- \rightarrow D\bar{D})$ from HE 05 for $\sigma(e^+ e^- \rightarrow \psi(3770))$.

30 Uses $B(\psi(2S) \rightarrow \gamma\chi_{c2}) = 9.22 \pm 0.11 \pm 0.46$ % from ATHAR 04, $\psi(2S)$ mass and width from PDG 04, and $\Gamma_{ee}(\psi(2S)) = 2.54 \pm 0.03 \pm 0.11$ keV from ADAM 06.

31 Averages the two measurements from COAN 06A and BRIERE 06.

32 Uses $B(\psi(2S) \rightarrow \gamma\chi_{c1}) = 9.07 \pm 0.11 \pm 0.54$ % from ATHAR 04, $\psi(2S)$ mass and width from PDG 04, and $\Gamma_{ee}(\psi(2S)) = 2.54 \pm 0.03 \pm 0.11$ keV from ADAM 06.

33 Using $B(\psi(3770) \rightarrow J/\psi\pi^+\pi^-) = (1.89 \pm 0.20 \pm 0.20) \times 10^{-3}$ from ADAM 06.

34 Uses $B(\psi(2S) \rightarrow \gamma\chi_{c0}) = 9.33 \pm 0.14 \pm 0.61$ % from ATHAR 04, $\psi(2S)$ mass and width from PDG 04, and $\Gamma_{ee}(\psi(2S)) = 2.54 \pm 0.03 \pm 0.11$ keV from ADAM 06.

35 Not independent of other results in BRIERE 06.

36 Assuming maximal destructive interference between $\psi(3770)$ and continuum sources.

 $\psi(3770)$ REFERENCES

ANASHIN	12A	PL B711 292	V.V. Anashin <i>et al.</i>	(KEDR Collab.)	REFID=54055
ABLIKIM	10D	EPJ C66 11	M. Ablikim <i>et al.</i>	(BES II Collab.)	REFID=53350
BESSON	10	PRL 104 159901E	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=53245
ABLIKIM	09C	EPJ C64 243	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=53134
PEDLAR	09	PR D79 111101	T.K. Pedlar <i>et al.</i>	(CLEO Collab.)	REFID=52998
ABLIKIM	08B	PL B659 74	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52129
ABLIKIM	08D	PL B660 315	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52142
ABLIKIM	08M	PL B670 179	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52569
ABLIKIM	08N	PL B670 184	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52570
AUBERT	08B	PR D77 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52120
BRODZICKA	08	PRL 100 092001	J. Brodzicka <i>et al.</i>	(BELLE Collab.)	REFID=52144
PAKHLOVA	08	PR D77 011103	G. Pakhlova <i>et al.</i>	(BELLE Collab.)	REFID=52132
ABLIKIM	07B	PL B650 111	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51704
ABLIKIM	07E	PL B652 238	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51882
ABLIKIM	07F	PL B656 30	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51940
ABLIKIM	07I	EPJ C52 805	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52045
ABLIKIM	07K	PR D76 122002	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=52073
AUBERT	07BE	PR D76 111105	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52074
DOBBS	07	PR D76 112001	S. Dobbs <i>et al.</i>	(CLEO Collab.)	REFID=52075
ABLIKIM	06L	PRL 97 121801	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51129
ABLIKIM	06N	PL B641 145	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=51131
ADAM	06	PRL 96 082004	N.E. Adam <i>et al.</i>	(CLEO Collab.)	REFID=50989
ADAMS	06	PRL D73 012002	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=50990
BESSON	06	PRL 96 092002	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=51041
Also		PRL 104 159901E	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=53245
BRIERE	06	PR D74 031106	R.A. Briere <i>et al.</i>	(CLEO Collab.)	REFID=51149
COAN	06A	PRL 96 182002	T.E. Coan <i>et al.</i>	(CLEO Collab.)	REFID=51155
CRONIN-HEN... 06		PR D74 012005	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)	REFID=51156
HUANG	06A	PRL 96 032003	G.S. Huang <i>et al.</i>	(CLEO Collab.)	REFID=50999
BAI	05	PL B605 63	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50332
HE	05	PRL 95 121801	Q. He <i>et al.</i>	(CLEO Collab.)	REFID=50924
Also		PRL 96 199903 (errat.)	Q. He <i>et al.</i>	(CLEO Collab.)	REFID=51211
ABLIKIM	04F	PR D70 077101	M. Ablikim <i>et al.</i>	(BES Collab.)	REFID=50185
ATHAR	04	PR D70 112002	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=50331
CHISTOV	04	PRL 93 051803	R. Chistov <i>et al.</i>	(BELLE Collab.)	REFID=50002
PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)	REFID=49653
BAI	02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=50506
ADLER	88C	PRL 60 89	J. Adler <i>et al.</i>	(Mark III Collab.)	REFID=40361
SCHINDLER	80	PR D21 2716	R.H. Schindler <i>et al.</i>	(Mark II Collab.)	REFID=22222
BACINO	78	PRL 40 671	W.J. Bacino <i>et al.</i>	(SLAC, UCLA, UCI)	REFID=11437
RAPIDIS	77	PRL 39 526	P.A. Rapidis <i>et al.</i>	(LGW Collab.)	REFID=22220

NODE=M053

NODE=M176

X(3872)

$$I^G(J^P) = 0^+(1^{++})$$

First observed by CHOI 03 in $B \rightarrow K\pi^+\pi^- J/\psi(1S)$ decays as a narrow peak in the invariant mass distribution of the $\pi^+\pi^- J/\psi(1S)$ final state. Isovector hypothesis excluded by AUBERT 05B and CHOI 11.

AAIJ 13Q perform a full five-dimensional amplitude analysis of the angular correlations between the decay products in $B^+ \rightarrow X(3872)K^+$ decays, where $X(3872) \rightarrow J/\psi\pi^+\pi^-$ and $J/\psi \rightarrow \mu^+\mu^-$, which unambiguously gives the $J^P = 1^{++}$ assignment.

See our note on "Developments in Heavy Quarkonium Spectroscopy".

X(3872) MASS FROM $J/\psi X$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3871.68 ± 0.17 OUR AVERAGE				
3871.95 ± 0.48 ± 0.12	0.6k	AAIJ	12H	LHCb $p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
3871.85 ± 0.27 ± 0.19	~ 170	¹ CHOI	11	BELL $B \rightarrow K\pi^+\pi^- J/\psi$
3873 ± 1.8 ± 1.3	27 ± 8	² DEL-AMO-SA.10B	BABR	$B \rightarrow \omega J/\psi K$
3871.61 ± 0.16 ± 0.19	6k	^{2,3} AALTONEN	09AU CDF2	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
3871.4 ± 0.6 ± 0.1	93.4	AUBERT	08Y BABR	$B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$
3868.7 ± 1.5 ± 0.4	9.4	AUBERT	08Y BABR	$B^0 \rightarrow K_S^0 J/\psi\pi^+\pi^-$
3871.8 ± 3.1 ± 3.0	522	^{2,4} ABAZOV	04F D0	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3868.6 ± 1.2 ± 0.2	8	⁵ AUBERT	06	BABR $B^0 \rightarrow K_S^0 J/\psi\pi^+\pi^-$
3871.3 ± 0.6 ± 0.1	61	⁵ AUBERT	06	BABR $B^- \rightarrow K^- J/\psi\pi^+\pi^-$
3873.4 ± 1.4	25	⁶ AUBERT	05R BABR	$B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$
3871.3 ± 0.7 ± 0.4	730	^{2,7} ACOSTA	04	CDF2 $p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$
3872.0 ± 0.6 ± 0.5	36	⁸ CHOI	03	BELL $B \rightarrow K\pi^+\pi^- J/\psi$
3836 ± 13	58	^{2,9} ANTONIAZZI	94 E705	$300 \pi^\pm \text{Li} \rightarrow J/\psi\pi^+\pi^- X$

¹ The mass difference for the $X(3872)$ produced in B^+ and B^0 decays is $(-0.71 \pm 0.96 \pm 0.19)$ MeV.

² Width consistent with detector resolution.

³ A possible equal mixture of two states with a mass difference greater than $3.6 \text{ MeV}/c^2$ is excluded at 95% CL.

⁴ Calculated from the corresponding $m_{X(3872)} - m_{J/\psi}$ using $m_{J/\psi} = 3096.916 \text{ MeV}$.

⁵ Calculated from the corresponding $m_{X(3872)} - m_{\psi(2S)}$ using $m_{\psi(2S)} = 3686.093 \text{ MeV}$. Superseded by AUBERT 08Y.

⁶ Calculated from the corresponding $m_{X(3872)} - m_{\psi(2S)}$ using $m_{\psi(2S)} = 3685.96 \text{ MeV}$. Superseded by AUBERT 06.

⁷ Superseded by AALTONEN 09AU.

⁸ Superseded by CHOI 11.

⁹ A lower mass value can be due to an incorrect momentum scale for soft pions.

X(3872) MASS FROM $\bar{D}^{*0} D^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3872.9 $^{+0.6}_{-0.4}$ $^{+0.4}_{-0.5}$	50 ^{10,11} AUSHEV	10	BELL	$B \rightarrow \bar{D}^{*0} D^0 K$
3875.1 $^{+0.7}_{-0.5}$ $^{+0.5}_{-0.5}$	33 ± 6 ¹¹ AUBERT	08B BABR	$B \rightarrow \bar{D}^{*0} D^0 K$	OCCUR=2
3875.2 ± 0.7 $^{+0.9}_{-1.8}$	24 ± 6 ^{11,12} GOKHROO	06	BELL	$B \rightarrow D^0 \bar{D}^0 \pi^0 K$

¹⁰ Calculated from the measured $m_{X(3872)} - m_{D^{*0}} - m_{\bar{D}^0} = 1.1 $^{+0.6}_{-0.4}$ $^{+0.1}_{-0.3}$ MeV.$

¹¹ Experiments report $D^{*0}\bar{D}^0$ invariant mass above $D^{*0}\bar{D}^0$ threshold because D^{*0} decay products are kinematically constrained to the D^{*0} mass, even though the D^{*0} may decay off-shell.

¹² Superseded by AUSHEV 10.

NODE=M176M

NODE=M176M

OCCUR=2

NODE=M176M;LINKAGE=CO

NODE=M176M;LINKAGE=AC

NODE=M176M;LINKAGE=AA

NODE=M176M;LINKAGE=AB

NODE=M176M;LINKAGE=AE

NODE=M176M;LINKAGE=AU

NODE=M176M;LINKAGE=AT

NODE=M176M;LINKAGE=CH

NODE=M176M;LINKAGE=AN

NODE=M176MD0

NODE=M176MD0

NODE=M176MD0;LINKAGE=AS

NODE=M176MD0;LINKAGE=AU

NODE=M176MD0;LINKAGE=GO

$m_{X(3872)} - m_{J/\psi}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
774.9±3.1±3.0	522	ABAZOV	04F D0	$p\bar{p} \rightarrow J/\psi\pi^+\pi^- X$

 $m_{X(3872)} - m_{\psi(2S)}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
187.4±1.4	25	13 AUBERT	05R BABR	$B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$
13 Superseded by AUBERT 06.				

 $X(3872)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<1.2	90		CHOI	11 BELL	$B \rightarrow K\pi^+\pi^- J/\psi$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.3	90		AUBERT	08Y BABR	$B^+ \rightarrow K^+ J/\psi\pi^+\pi^-$
<4.1	90	69	AUBERT	06 BABR	$B \rightarrow K\pi^+\pi^- J/\psi$
<2.3	90	36	14 CHOI	03 BELL	$B \rightarrow K\pi^+\pi^- J/\psi$

14 Superseded by CHOI 11.

 $X(3872)$ WIDTH FROM $\bar{D}^{*0} D^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.9 ^{+2.8+0.2} _{-1.4-1.1}	50	15 AUSHEV	10 BELL	$B \rightarrow \bar{D}^{*0} D^0 K$
3.0 ^{+1.9} _{-1.4} ±0.9	33 ± 6	AUBERT	08B BABR	$B \rightarrow \bar{D}^{*0} D^0 K$
15 With a measured value of $B(B \rightarrow X(3872)K) \times B(X(3872) \rightarrow D^{*0}\bar{D}^0) = (0.80 \pm 0.20 \pm 0.10) \times 10^{-4}$, assumed to be equal for both charged and neutral modes.				

 $X(3872)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	
$\Gamma_2 \pi^+\pi^- J/\psi(1S)$	>2.6 %
$\Gamma_3 \rho^0 J/\psi(1S)$	
$\Gamma_4 \omega J/\psi(1S)$	>1.9 %
$\Gamma_5 D^0 \bar{D}^0 \pi^0$	$>3.2 \times 10^{-3}$
$\Gamma_6 \bar{D}^{*0} D^0$	$>5 \times 10^{-3}$
$\Gamma_7 \gamma\gamma$	
$\Gamma_8 D^0 \bar{D}^0$	
$\Gamma_9 D^+ D^-$	
$\Gamma_{10} \gamma\chi_{c1}$	
$\Gamma_{11} \eta J/\psi$	
$\Gamma_{12} \gamma J/\psi$	$>6 \times 10^{-3}$
$\Gamma_{13} \gamma\psi(2S)$	[a] >3.0 %
$\Gamma_{14} \pi^+\pi^-\eta_c(1S)$	not seen

[a] BHARDWAJ 11 does not observe this decay and presents a stronger 90% CL limit than this value. See measurements listings for details.

 $X(3872)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$	Γ_1
VALUE (keV)	CL%
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.28	90
16 YUAN	
04 RVUE $e^+e^- \rightarrow \pi^+\pi^- J/\psi$	
16 Using BAI 98E data on $e^+e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$. Assuming that $\Gamma(\pi^+\pi^- J/\psi)$ of $X(3872)$ is the same as that of $\psi(2S)$ (85.4 keV).	

NODE=M176207

NODE=M176DM

NODE=M176DM2

NODE=M176DM2

NODE=M176DM2;LINKAGE=AU

NODE=M176W

NODE=M176W

NODE=M176W;LINKAGE=CH

NODE=M176WD0

NODE=M176WD0

NODE=M176WD0;LINKAGE=AU

NODE=M176215;NODE=M176

DESIG=1

DESIG=2

DESIG=10

DESIG=13

DESIG=8

DESIG=12

DESIG=5

DESIG=6

DESIG=7

DESIG=3

DESIG=4

DESIG=9

DESIG=11

DESIG=14;OUR EVAL;→ UNCHECKED ←

LINKAGE=BBL

NODE=M176220

NODE=M176W1

NODE=M176W1

NODE=M176W1;LINKAGE=A

X(3872) $\Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\pi^+\pi^- J/\psi(1S)) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_1/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
< 6.2	90	17,18 AUBERT	05D BABR	$10.6 e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 8.3	90	18 DOBBS	05 CLE3	$e^+e^- \rightarrow \pi^+\pi^-J/\psi$
< 10	90	19 YUAN	04 RVUE	$e^+e^- \rightarrow \pi^+\pi^-J/\psi$
17 Using $B(X(3872) \rightarrow J/\psi\pi^+\pi^-) \cdot B(J/\psi \rightarrow \mu^+\mu^-) \cdot \Gamma(X(3872) \rightarrow e^+e^-) < 0.37$ eV from AUBERT 05D and $B(J/\psi \rightarrow \mu^+\mu^-) = 0.0588 \pm 0.0010$ from the PDG 04.				
18 Assuming $X(3872)$ has $JPC = 1--$.				
19 Using BAI 98E data on $e^+e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$. From theoretical calculation of the production cross section and using $B(J/\psi \rightarrow \mu^+\mu^-) = (5.88 \pm 0.10)\%$.				

X(3872) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\pi^+\pi^- J/\psi(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_7/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 12.9	90	20 DOBBS	05 CLE3	$e^+e^- \rightarrow \pi^+\pi^-J/\psi\gamma$
20 Assuming $X(3872)$ has positive C parity and spin 0.				

$\Gamma(\omega J/\psi(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_4\Gamma_7/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 1.7	90	21 LEES	12AD BABR	$e^+e^- \rightarrow e^+e^-\omega J/\psi$
21 Assuming $X(3872)$ has spin 2.				

$\Gamma(\pi^+\pi^-\eta_c(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	$\Gamma_{14}\Gamma_7/\Gamma$			
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
< 11.1	90	LEES	12AE BABR	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-\eta_c$

X(3872) BRANCHING RATIOS

$\Gamma(\pi^+\pi^- J/\psi(1S))/\Gamma_{\text{total}}$	Γ_2/Γ			
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
>0.026				
>0.026	93 ± 17	22 AUBERT	08Y BABR	$B \rightarrow X(3872)K$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
>0.04	30	23 AUBERT	05R BABR	$B^+ \rightarrow K^+J/\psi\pi^+\pi^-$
>0.04	36 ± 7	24 CHOI	03 BABR	$B^+ \rightarrow K^+J/\psi\pi^+\pi^-$
22 AUBERT 08Y	reports $[\Gamma(X(3872) \rightarrow \pi^+\pi^-J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (8.4 \pm 1.5 \pm 0.7) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.			
23 Superseded by AUBERT 08Y. AUBERT 05R reports $[\Gamma(X(3872) \rightarrow \pi^+\pi^-J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (1.28 \pm 0.41) \times 10^{-5}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.				
24 CHOI 03 reports $[\Gamma(X(3872) \rightarrow \pi^+\pi^-J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] / [B(B^+ \rightarrow \psi(2S)K^+)] / [B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-)] = 0.063 \pm 0.012 \pm 0.007$ which we multiply or divide by our best values $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$, $B(B^+ \rightarrow \psi(2S)K^+) = (6.27 \pm 0.24) \times 10^{-4}$, $B(\psi(2S) \rightarrow J/\psi(1S)\pi^+\pi^-) = (34.0 \pm 0.4) \times 10^{-2}$.				

$\Gamma(\omega J/\psi(1S))/\Gamma_{\text{total}}$	Γ_4/Γ			
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
>0.019				
>0.019	21 ± 7	25 DEL-AMO-SA..10B	BABR	$B^+ \rightarrow \omega J/\psi K^+$
25 DEL-AMO-SANCHEZ 10B	reports $[\Gamma(X(3872) \rightarrow \omega J/\psi(1S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (6 \pm 2 \pm 1) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$. DEL-AMO-SANCHEZ 10B also reports $B(B^0 \rightarrow X(3872)K^0) \times B(X(3872) \rightarrow J/\psi\omega) = (6 \pm 3 \pm 1) \times 10^{-6}$.			

NODE=M176230

NODE=M176G1

NODE=M176G1

NODE=M176G1;LINKAGE=AU

NODE=M176G1;LINKAGE=DO

NODE=M176G1;LINKAGE=A

NODE=M176232

NODE=M176H1

NODE=M176H1

NODE=M176H1;LINKAGE=DO

NODE=M176G01

NODE=M176G01

NODE=M176G01;LINKAGE=LE

NODE=M176G02

NODE=M176G02

NODE=M176235

NODE=M176R6

NODE=M176R6

NODE=M176R6;LINKAGE=AB

NODE=M176R6;LINKAGE=AE

NODE=M176R6;LINKAGE=CH

NODE=M176R14

NODE=M176R14

NODE=M176R14;LINKAGE=DE

$\Gamma(\omega J/\psi(1S))/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_4/Γ_2
VALUE	DOCUMENT ID	TECN	COMMENT		
0.8±0.3	26 DEL-AMO-SA..10B	BABR	$B \rightarrow \omega J/\psi K$		NODE=M176R15 NODE=M176R15

26 Statistical and systematic errors added in quadrature. Uses the values of $B(B \rightarrow X(3872)K) \times B(X(3872) \rightarrow J/\psi\pi^+\pi^-)$ reported in AUBERT 08Y, taking into account the common systematics.

$\Gamma(D^0\bar{D}^0\pi^0)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
>3.2 × 10⁻³	17 ± 5	27 GOKHROO	06 BELL	$B^+ \rightarrow D^0\bar{D}^0\pi^0 K^+$	NODE=M176R12 NODE=M176R12

27 GOKHROO 06 reports $[\Gamma(X(3872) \rightarrow D^0\bar{D}^0\pi^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (1.02 \pm 0.31 \pm 0.21) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.

$\Gamma(\bar{D}^*{}^0 D^0)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
>5 × 10⁻³	27 ± 6	28 AUBERT	08B BABEL	$B^+ \rightarrow \bar{D}^*{}^0 D^0 K^+$	NODE=M176R13 NODE=M176R13

28 AUBERT 08B reports $[\Gamma(X(3872) \rightarrow \bar{D}^*{}^0 D^0)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (1.67 \pm 0.36 \pm 0.47) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.

$\Gamma(D^0\bar{D}^0\pi^0)/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_5/Γ_2
VALUE	DOCUMENT ID	TECN	COMMENT		
seen	29 GOKHROO	06 BELL	$B \rightarrow D^0\bar{D}^0\pi^0 K$		NODE=M176R5 NODE=M176R5
• • • We do not use the following data for averages, fits, limits, etc. • • •					

seen AUSHEV 10 BELL $B \rightarrow D^0\bar{D}^0\pi^0 K$
29 May not necessarily be the same state as that observed in the $J/\psi\pi^+\pi^-$ mode. Supersedes CHISTOV 04.

$\Gamma(D^0\bar{D}^0)/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_8/Γ_2
VALUE	DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •					NODE=M176R3 NODE=M176R3

$\Gamma(D^+D^-)/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_9/Γ_2
VALUE	DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •					NODE=M176R4 NODE=M176R4

not seen CHISTOV 04 BELL $B \rightarrow KD^+D^-$

$\Gamma(\gamma\chi_{c1})/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_{10}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.89	90	CHOI	03 BELL	$B \rightarrow K\pi^+\pi^- J/\psi$	NODE=M176R1 NODE=M176R1

$\Gamma(\eta J/\psi)/\Gamma(\pi^+\pi^- J/\psi(1S))$					Γ_{11}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •					NODE=M176R2 NODE=M176R2

<0.6 AUBERT 04Y BABR $B \rightarrow K\eta J/\psi$

$\Gamma(\gamma J/\psi)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
>6 × 10⁻³	30 BHARDWAJ	11 BELL	$B^\pm \rightarrow \gamma J/\psi K^\pm$		NODE=M176R7 NODE=M176R7

• • • We do not use the following data for averages, fits, limits, etc. • • •
 $>6 \times 10^{-3}$ 20 31 AUBERT 09B BABR $B^+ \rightarrow \gamma J/\psi K^+$
 >0.010 19 32 AUBERT,BE 06M BABR $B^+ \rightarrow \gamma J/\psi K^+$
30 BHARDWAJ 11 reports $[\Gamma(X(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (1.78^{+0.48}_{-0.44} \pm 0.12) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.

31 AUBERT 09B reports $[\Gamma(X(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (2.8 \pm 0.8 \pm 0.1) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.

32 Superseded by AUBERT 09B. AUBERT,BE 06M reports $[\Gamma(X(3872) \rightarrow \gamma J/\psi)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (3.3 \pm 1.0 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.

NODE=M176R15
NODE=M176R15

NODE=M176R15;LINKAGE=DE

NODE=M176R12
NODE=M176R12

NODE=M176R12;LINKAGE=GO

NODE=M176R13
NODE=M176R13

NODE=M176R5
NODE=M176R5

NODE=M176R4
NODE=M176R4

NODE=M176R1
NODE=M176R1

NODE=M176R2
NODE=M176R2

NODE=M176R7
NODE=M176R7

NODE=M176R7;LINKAGE=BA

NODE=M176R7;LINKAGE=AB

NODE=M176R7;LINKAGE=AU

$\Gamma(\gamma\psi(2S))/\Gamma_{\text{total}}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{13}/Γ
not seen		33 BHARDWAJ	11 BELL	$B^+ \rightarrow \gamma\psi(2S)K^+$	
>0.030	25 ± 7	34 AUBERT	09B BABR	$B^+ \rightarrow \gamma\psi(2S)K^+$	
33 BHARDWAJ	11 reports $B(B^+ \rightarrow K^+ X(3872)) \times B(X \rightarrow \gamma\psi(2S)) < 3.45 \times 10^{-6}$ at 90% CL.				NODE=M176R10;LINKAGE=BH
34 AUBERT	09B reports $[\Gamma(X(3872) \rightarrow \gamma\psi(2S))/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow X(3872)K^+)] = (9.5 \pm 2.7 \pm 0.6) \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow X(3872)K^+) < 3.2 \times 10^{-4}$.				NODE=M176R10;LINKAGE=AU

 $\Gamma(\gamma\psi(2S))/\Gamma(\gamma J/\psi)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{13}/Γ_{12}
<2.1	90	BHARDWAJ	11 BELL	$B^+ \rightarrow K^+\psi(2S)\gamma$	
3.4±1.4		AUBERT	09B BABR	$B^+ \rightarrow \gamma c\bar{c}K'$	

X(3872) REFERENCES

AAIJ	13Q	PRL 110 222001	R. Aaij <i>et al.</i>	(LHCb Collab.) JP	REFID=54985
AAIJ	12H	EPJ C72 1972	R. Aaij <i>et al.</i>	(LHCb Collab.)	REFID=54056
LEES	12AD	PR D86 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54751
LEES	12AE	PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54752
BHARDWAJ	11	PRL 107 091803	V. Bhardwaj <i>et al.</i>	(BELLE Collab.)	REFID=53779
CHOI	11	PR D84 052004	S.-K. Choi <i>et al.</i>	(BELLE Collab.)	REFID=53934
AUSHEV	10	PR D81 031103	T. Aushev <i>et al.</i>	(BELLE Collab.)	REFID=53225
DEL-AMO-SA...	10B	PR D82 011101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=53362
AALTONEN	09AU	PRL 103 152001	T. Aaltonen <i>et al.</i>	(CDF Collab.)	REFID=53098
AUBERT	09B	PRL 102 132001	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52722
AUBERT	08B	PR D77 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52120
AUBERT	08Y	PR D77 111101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52265
AUBERT	06	PR D73 011101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51017
AUBERT,BE	06M	PR D74 071101	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=51454
GOKHROO	06	PRL 97 162002	G. Gokhroo <i>et al.</i>	(BELLE Collab.)	REFID=51432
AUBERT	05B	PR D71 031501	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50498
AUBERT	05D	PR D71 052001	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50509
AUBERT	05R	PR D71 071103	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=50627
DOBBS	05	PRL 94 032004	S. Dobbs <i>et al.</i>	(CLEO Collab.)	REFID=50458
ABAZOV	04F	PRL 93 162002	V.M. Abazov <i>et al.</i>	(D0 Collab.)	REFID=50200
ACOSTA	04	PRL 93 072001	D. Acosta <i>et al.</i>	(CDF Collab.)	REFID=49742
AUBERT	04Y	PRL 93 041801	B. Aubert <i>et al.</i>	(BaBar Collab.)	REFID=49997
CHISTOV	04	PRL 93 051803	R. Chistov <i>et al.</i>	(BELLE Collab.)	REFID=50002
PDG	04	PL B592 1	S. Eidelman <i>et al.</i>	(PDG Collab.)	REFID=49653
YUAN	04	PL B579 74	C.Z. Yuan <i>et al.</i>		REFID=49677
CHOI	03	PR L 91 262001	S.-K. Choi <i>et al.</i>	(BELLE Collab.)	REFID=49628
BAI	98E	PR D57 3854	J.Z. Bai <i>et al.</i>	(BES Collab.)	REFID=46339
ANTONIAZZI	94	PR D50 4258	L. Antoniazzi <i>et al.</i>	(E705 Collab.)	REFID=44074

NODE=M176R10
NODE=M176R10

NODE=M176R10;LINKAGE=BH

NODE=M176R10;LINKAGE=AU

NODE=M176R11
NODE=M176R11

NODE=M176

NODE=M159

$\chi_{c0}(2P)$
was $X(3915)$

$I^G(J^{PC}) = 0^+(0^{++})$

$\chi_{c0}(2P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3918.4 ± 1.9 OUR AVERAGE				
[3917.5 ± 2.7 MeV OUR 2012 AVERAGE]				
3919.4 ± 2.2 ± 1.6	59 ± 10	LEES	12AD BABR	$e^+ e^- \rightarrow e^+ e^- \omega J/\psi$
3919.1 ± 3.8 ± 3.4	2.0	DEL-AMO-SA..10B	BABR	$B \rightarrow \omega J/\psi K$
3915 ± 3 ± 2	49 ± 15	UEHARA	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \omega J/\psi$
3943 ± 11 ± 13	58 ± 11	¹ CHOI	05 BELL	$B \rightarrow \omega J/\psi K$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3914.6 ± 3.8 ± 3.4	2.0	¹ AUBERT	08W BABR	Superseded by DEL-AMO-SANCHEZ 10B
1 $\omega J/\psi$ threshold enhancement fitted as an S-wave Breit-Wigner resonance.				

NODE=M159M

NODE=M159M
NEW

$\chi_{c0}(2P)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
20 ± 5 OUR AVERAGE				
Error includes scale factor of 1.1. [27 ± 10 MeV OUR 2012 AVERAGE Scale factor = 1.4]				
13 ± 6 ± 3	59 ± 10	LEES	12AD BABR	$e^+ e^- \rightarrow e^+ e^- \omega J/\psi$
31 ± 10 ± 8	5	DEL-AMO-SA..10B	BABR	$B \rightarrow \omega J/\psi K$
17 ± 10 ± 3	49 ± 15	UEHARA	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \omega J/\psi$
87 ± 22 ± 26	58 ± 11	² CHOI	05 BELL	$B \rightarrow \omega J/\psi K$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
34 ± 12 ± 8	5	² AUBERT	08W BABR	Superseded by DEL-AMO-SANCHEZ 10B
2 $\omega J/\psi$ threshold enhancement fitted as an S-wave Breit-Wigner resonance.				

NODE=M159M;LINKAGE=CH

NODE=M159W

NODE=M159W
NEW

$\chi_{c0}(2P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \omega J/\psi$	seen
$\Gamma_2 \bar{D}^* D^0$	
$\Gamma_3 \pi^+ \pi^- \eta_c(1S)$	not seen
$\Gamma_4 \gamma\gamma$	seen

NODE=M159W;LINKAGE=CH

NODE=M159215;NODE=M159

DESIG=1;OUR EST; \rightarrow UNCHECKED
 DESIG=3
 DESIG=4;OUR EVAL; \rightarrow UNCHECKED
 DESIG=2

NODE=M159220

NODE=M159G01
NODE=M159G01
NEW

OCCUR=2

NODE=M159G01;LINKAGE=UH
NODE=M159G01;LINKAGE=URNODE=M159G02
NODE=M159G02

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_1 \Gamma_4 / \Gamma$
54 ± 9 OUR AVERAGE					
[18 ± 5 eV OUR 2012 AVERAGE]					
52 ± 10 ± 3	59 ± 10	³ LEES	12AD BABR	$e^+ e^- \rightarrow e^+ e^- \omega J/\psi$	
61 ± 17 ± 8	49 ± 15	³ UEHARA	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \omega J/\psi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
18 ± 5 ± 2	49 ± 15	⁴ UEHARA	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \omega J/\psi$	
3 For $J^P = 0^+$. 4 For $J^P = 2^+$, helicity-2.					
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	$\Gamma_3 \Gamma_4 / \Gamma$
<16	90	LEES	12AE BABR	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$	

$\chi_{c0}(2P)$ BRANCHING RATIOS

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$		Γ_4/Γ			
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
seen	59 ± 10	LEES	12AD BABR	$e^+ e^- \rightarrow e^+ e^- \omega J/\psi$	
seen		UEHARA	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- \omega J/\psi$	
$\Gamma(\omega J/\psi)/\Gamma(\bar{D}^{*0} D^0)$				Γ_1/Γ_2	
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
>0.71	90	5 AUSHEV	10 BELL	$B \rightarrow \bar{D}^{*0} D^0 K$	
5 By combining the upper limit $B(B \rightarrow X(3915)K) \times B(X(3915) \rightarrow D^{*0} \bar{D}^0) < 0.67 \times 10^{-4}$ from AUSHEV 10 with the average of CHOI 05 and AUBERT 08W measurements $B(B \rightarrow X(3915)K) \times B(X(3915) \rightarrow \omega J/\psi) = (0.51 \pm 0.11) \times 10^{-4}$.					
$\Gamma(\omega J/\psi)/\Gamma_{\text{total}}$		Γ_1/Γ			
VALUE		DOCUMENT ID	TECN	COMMENT	
seen		6 DEL-AMO-SA..10B	BABR	$B \rightarrow \omega J/\psi K$	
seen		7 CHOI	05 BELL	$B \rightarrow \omega J/\psi K$	
6 DEL-AMO-SANCHEZ 10B reports $B(B^\pm \rightarrow X(3915)K^\pm) \times B(X(3915) \rightarrow J/\psi \omega) = (3.0^{+0.7+0.5}_{-0.6-0.3}) \times 10^{-5}$ and $B(B^0 \rightarrow X(3915)K^0) \times B(X(3915) \rightarrow J/\psi \omega) = (2.1 \pm 0.9 \pm 0.3) \times 10^{-5}$. 7 CHOI 05 reports $B(B \rightarrow X(3915)K) \times B(X(3915) \rightarrow J/\psi \omega) = (7.1 \pm 1.3 \pm 3.1) \times 10^{-5}$.					

$\chi_{c0}(2P)$ REFERENCES

LEES	12AD PR D86 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	12AE PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
AUSHEV	10 PR D81 031103	T. Aushev <i>et al.</i>	(BELLE Collab.)
DEL-AMO-SA... 10B	PR D82 011101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
UEHARA	10 PRL 104 092001	S. Uehara <i>et al.</i>	(BELLE Collab.)
AUBERT	08W PRL 101 082001	B. Aubert <i>et al.</i>	(BABAR Collab.)
CHOI	05 PRL 94 182002	S.-K. Choi <i>et al.</i>	(BELLE Collab.)

$\chi_{c2}(2P)$

$$I^G(J^{PC}) = 0^+(2^{++})$$

$\chi_{c2}(2P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3927.2 ± 2.6 OUR AVERAGE				
3926.7 ± 2.7 ± 1.1	76 ± 17	AUBERT	10G BABR	$10.6 e^+ e^- \rightarrow e^+ e^- D \bar{D}$
3929 ± 5 ± 2	64	UEHARA	06 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- D \bar{D}$

$\chi_{c2}(2P)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
24 ± 6 OUR AVERAGE				
21.3 ± 6.8 ± 3.6	76 ± 17	AUBERT	10G BABR	$10.6 e^+ e^- \rightarrow e^+ e^- D \bar{D}$
29 ± 10 ± 2	64	UEHARA	06 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- D \bar{D}$

$\chi_{c2}(2P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \gamma\gamma$	seen
$\Gamma_2 K\bar{K}\pi$	
$\Gamma_3 K^+ K^- \pi^+ \pi^- \pi^0$	
$\Gamma_4 D\bar{D}$	seen
$\Gamma_5 D^+ D^-$	seen
$\Gamma_6 D^0 \bar{D}^0$	seen
$\Gamma_7 \pi^+ \pi^- \eta_c(1S)$	not seen

NODE=M159225

NODE=M159R01
NODE=M159R01NODE=M159R02
NODE=M159R02

NODE=M159R02;LINKAGE=AU

NODE=M159R03
NODE=M159R03

NODE=M159R03;LINKAGE=DE

NODE=M159R03;LINKAGE=CH

NODE=M159

REFID=54751
REFID=54752
REFID=53225
REFID=53362
REFID=53232
REFID=52263
REFID=50737

NODE=M050

NODE=M050M

NODE=M050M

NODE=M050W

NODE=M050W

NODE=M050215;NODE=M050

DESIG=1;OUR EVAL; \rightarrow UNCHECKED
DESIG=5
DESIG=6
DESIG=2;OUR EVAL; \rightarrow UNCHECKED
DESIG=3;OUR EVAL; \rightarrow UNCHECKED
DESIG=4;OUR EVAL; \rightarrow UNCHECKED
DESIG=7;OUR EVAL; \rightarrow UNCHECKED

$\chi_{c2}(2P)$ PARTIAL WIDTHS **$\chi_{c2}(2P) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$**

$\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$				$\Gamma_2\Gamma_1/\Gamma$
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<2.1	90	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$

$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$				$\Gamma_3\Gamma_1/\Gamma$
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<3.4	90	DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

$\Gamma(D\bar{D}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$				$\Gamma_4\Gamma_1/\Gamma$
VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.21±0.04 OUR AVERAGE				
0.24±0.05±0.04	76 ± 17	AUBERT	10G	BABR $e^+ e^- \rightarrow e^+ e^- D\bar{D}$
0.18±0.05±0.03	64	UEHARA	06	BELL $10.6 e^+ e^- \rightarrow e^+ e^- D\bar{D}$

1 Assuming $B(D^+ D^-) = 0.89 B(D^0 \bar{D}^0)$.

$\Gamma(\pi^+ \pi^- \eta_c(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$				$\Gamma_7\Gamma_1/\Gamma$
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<18	90	LEES	12AE	BABR $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$

 $\chi_{c2}(2P)$ BRANCHING RATIOS

$\Gamma(D^+ D^-)/\Gamma(D^0 \bar{D}^0)$				Γ_5/Γ_6
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.74±0.43±0.16	64	UEHARA	06	BELL $10.6 e^+ e^- \rightarrow e^+ e^- D\bar{D}$

 $\chi_{c2}(2P)$ REFERENCES

LEES	12AE	PR D86 092005	J.P. Lees <i>et al.</i>	(BABAR Collab.)
DEL-AMO-SA..	11M	PR D84 012004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
AUBERT	10G	PR D81 092003	B. Aubert <i>et al.</i>	(BABAR Collab.)
UEHARA	06	PRL 96 082003	S. Uehara <i>et al.</i>	(BELLE Collab.)

X(3940)

$I^G(J^{PC}) = ?^?(??)$

OMITTED FROM SUMMARY TABLE

Reported by ABE 07, observed in $e^+ e^- \rightarrow J/\psi X$.**X(3940) MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3942$^{+7}_{-6}$$\pm 6$	52	PAKHLOV	08	BELL $e^+ e^- \rightarrow J/\psi X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

3943 ± 6 ± 6	25	¹ ABE	07	BELL $e^+ e^- \rightarrow J/\psi X$
3936 ± 14	266	² ABE	07	BELL $e^+ e^- \rightarrow J/\psi(c\bar{c})$

1 From a fit to D^*+D^- and $D^{*0}\bar{D}^0$ events.

2 From the inclusive fit. Not independent of the exclusive measurement by ABE 07.

X(3940) WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
37$^{+26}_{-15}$$\pm 8$	52	PAKHLOV	08	BELL $e^+ e^- \rightarrow J/\psi X$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<52	90	25	ABE	07	BELL $e^+ e^- \rightarrow J/\psi X$
-----	----	----	-----	----	-------------------------------------

NODE=M050220

NODE=M050222

NODE=M050G01

NODE=M050G01

NODE=M050G02

NODE=M050G02

NODE=M050G1
NODE=M050G1

NODE=M050G1;LINKAGE=UE

NODE=M050G03
NODE=M050G03

NODE=M050225

NODE=M050R01
NODE=M050R01

NODE=M050

REFID=54752
REFID=16751
REFID=53357
REFID=51039

NODE=M029

NODE=M029

NODE=M029M

NODE=M029M

OCCUR=2

NODE=M029M;LINKAGE=EB
NODE=M029M;LINKAGE=EM

NODE=M029W

NODE=M029W

X(3940) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D\bar{D}^* + \text{c.c.}$	seen
$\Gamma_2 D\bar{D}$	not seen
$\Gamma_3 J/\psi\omega$	not seen

X(3940) BRANCHING RATIOS

$$\Gamma(D\bar{D}^* + \text{c.c.})/\Gamma_{\text{total}} \quad \Gamma_1/\Gamma$$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
-------	-----	------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

>0.45 90 25 3,4 ABE 07 BELL $e^+ e^- \rightarrow J/\psi X$

3 For $X(3940)$ decaying to final states with more than two tracks.

4 PAKHLOV 08 finds that the inclusive peak near $3940 \text{ MeV}/c^2$ may consist of several states.

$$\Gamma(D\bar{D})/\Gamma_{\text{total}} \quad \Gamma_2/\Gamma$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
-------	-----	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.41 90 5,6 ABE 07 BELL $e^+ e^- \rightarrow J/\psi X$

5 For $X(3940)$ decaying to final states with more than two tracks.

6 PAKHLOV 08 finds that the inclusive peak near $3940 \text{ MeV}/c^2$ may consist of several states.

$$\Gamma(J/\psi\omega)/\Gamma_{\text{total}} \quad \Gamma_3/\Gamma$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
-------	-----	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.26 90 7,8 ABE 07 BELL $e^+ e^- \rightarrow J/\psi X$

7 For $X(3940)$ decaying to final states with more than two tracks.

8 PAKHLOV 08 finds that the inclusive peak near $3940 \text{ MeV}/c^2$ may consist of several states.

X(3940) REFERENCES

PAKHLOV ABE	08 07	PRL 100 202001 PRL 98 082001	P. Pakhlov <i>et al.</i> K. Abe <i>et al.</i>	(BELLE Collab.) (BELLE Collab.)
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 $\psi(4040)$

$$I^G(J^{PC}) = 0^-(1^{--})$$

 $\psi(4040)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

4039 ± 1 OUR ESTIMATE

4039.6 ± 4.3

• • • We do not use the following data for averages, fits, limits, etc. • • •

4034 ± 6 2 MO 10 RVUE $e^+ e^- \rightarrow$ hadrons

4037 ± 2 3 SETH 05A RVUE $e^+ e^- \rightarrow$ hadrons

4040 ± 1 4 SETH 05A RVUE $e^+ e^- \rightarrow$ hadrons

4040 ± 10 BRANDELIK 78C DASP $e^+ e^- \rightarrow$ hadrons

1 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (130 \pm 46)^\circ$.

2 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.

3 From a fit to Crystal Ball (OSTERHELD 86) data.

4 From a fit to BES (BAI 02C) data.

 $\psi(4040)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

80 ± 10 OUR ESTIMATE

84.5 ± 12.3

5 ABLIKIM 08D BES2 $e^+ e^- \rightarrow$ hadrons

NODE=M029215;NODE=M029

DESIG=1;OUR EVAL;→ UNCHECKED ←
DESIG=2;OUR EVAL;→ UNCHECKED ←
DESIG=3;OUR EVAL;→ UNCHECKED ←

NODE=M029225

NODE=M029R01
NODE=M029R01

NODE=M029R01;LINKAGE=AB
NODE=M029R01;LINKAGE=AE

NODE=M029R02
NODE=M029R02

NODE=M029R02;LINKAGE=AB
NODE=M029R02;LINKAGE=AE

NODE=M029R03
NODE=M029R03

NODE=M029R03;LINKAGE=AB
NODE=M029R03;LINKAGE=AE

NODE=M029

REFID=52302
REFID=51627

NODE=M072

NODE=M072M

NODE=M072M
→ UNCHECKED ←

OCCUR=2

NODE=M072M;LINKAGE=AB

NODE=M072M;LINKAGE=MO

NODE=M072M;LINKAGE=ST
NODE=M072M;LINKAGE=SE

NODE=M072W

NODE=M072W
→ UNCHECKED ←

• • • We do not use the following data for averages, fits, limits, etc. • • •

87 ± 11	6 MO	10 RVUE	$e^+ e^- \rightarrow$	hadrons
85 ± 10	7 SETH	05A RVUE	$e^+ e^- \rightarrow$	hadrons
89 ± 6	8 SETH	05A RVUE	$e^+ e^- \rightarrow$	hadrons
52 ± 10	BRANDELIK	78C DASP	$e^+ e^-$	

5 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (130 \pm 46)^\circ$.

6 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.

7 From a fit to Crystal Ball (OSTERHELD 86) data.

8 From a fit to BES (BAI 02C) data.

OCCUR=2

NODE=M072W;LINKAGE=AB

NODE=M072W;LINKAGE=MO

NODE=M072W;LINKAGE=ST

NODE=M072W;LINKAGE=SE

NODE=M072215;NODE=M072

NODE=M072

$\psi(4040)$ DECAY MODES

Due to the complexity of the $c\bar{c}$ threshold region, in this listing, “seen” (“not seen”) means that a cross section for the mode in question has been measured at effective \sqrt{s} near this particle’s central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in \sqrt{s} or absence thereof. See mode listing(s) for details and references.

Mode	Fraction (Γ_i/Γ)	Confidence level	
Γ_1 $e^+ e^-$	$(1.07 \pm 0.16) \times 10^{-5}$		
Γ_2 $D\bar{D}$	seen		
Γ_3 $D^0\bar{D}^0$	seen		
Γ_4 D^+D^-	seen		
Γ_5 $D^*\bar{D} + \text{c.c.}$	seen		
Γ_6 $D^*(2007)^0\bar{D}^0 + \text{c.c.}$	seen		
Γ_7 $D^*(2010)^+D^- + \text{c.c.}$	seen		
Γ_8 $D^*\bar{D}^*$	seen		
Γ_9 $D^*(2007)^0\bar{D}^*(2007)^0$	seen		
Γ_{10} $D^*(2010)^+D^*(2010)^-$	seen		
Γ_{11} $D\bar{D}\pi(\text{excl. } D^*\bar{D})$			
Γ_{12} $D^0D^-\pi^++\text{c.c.}$ (excl. $D^*(2007)^0\bar{D}^0 + \text{c.c.}$, $D^*(2010)^+D^- + \text{c.c.}$)	not seen		DESIG=24
Γ_{13} $D\bar{D}^*\pi(\text{excl. } D^*\bar{D}^*)$	not seen		DESIG=25
Γ_{14} $D^0\bar{D}^*-\pi^++\text{c.c.}$ (excl. $D^*(2010)^+D^*(2010)^-$)	seen		DESIG=26
Γ_{15} $D_s^+D_s^-$	seen		DESIG=27
Γ_{16} $J/\psi(1S)\text{hadrons}$			DESIG=4
Γ_{17} $J/\psi\pi^+\pi^-$	$< 4 \times 10^{-3}$	90%	DESIG=7
Γ_{18} $J/\psi\pi^0\pi^0$	$< 2 \times 10^{-3}$	90%	DESIG=8
Γ_{19} $J/\psi\eta$	$(5.2 \pm 0.7) \times 10^{-3}$		DESIG=9
Γ_{20} $J/\psi\pi^0$	$< 2.8 \times 10^{-4}$	90%	DESIG=10
Γ_{21} $J/\psi\pi^+\pi^-\pi^0$	$< 2 \times 10^{-3}$	90%	DESIG=11
Γ_{22} $\chi_{c1}\gamma$	$< 1.1 \%$	90%	DESIG=12
Γ_{23} $\chi_{c2}\gamma$	$< 1.7 \%$	90%	DESIG=13
Γ_{24} $\chi_{c1}\pi^+\pi^-\pi^0$	$< 1.1 \%$	90%	DESIG=14
Γ_{25} $\chi_{c2}\pi^+\pi^-\pi^0$	$< 3.2 \%$	90%	DESIG=15
Γ_{26} $h_c(1P)\pi^+\pi^-$	$< 3 \times 10^{-3}$	90%	DESIG=28
Γ_{27} $\phi\pi^+\pi^-$	$< 3 \times 10^{-3}$	90%	DESIG=16
Γ_{28} $\mu^+\mu^-$			DESIG=6

$\psi(4040)$ PARTIAL WIDTHS

$\Gamma(e^+ e^-)$

VALUE (keV)

0.86±0.07 OUR ESTIMATE**0.83±0.20**

• • • We do not use the following data for averages, fits, limits, etc. • • •

	DOCUMENT ID	TECN	COMMENT	Γ_1
9 ABLIKIM	08D	BES2	$e^+ e^- \rightarrow$ hadrons	
10 MO	10	RVUE	$e^+ e^- \rightarrow$ hadrons	
11 SETH	05A	RVUE	$e^+ e^- \rightarrow$ hadrons	
12 SETH	05A	RVUE	$e^+ e^- \rightarrow$ hadrons	
	BRANDELIK	78C	DASP	$e^+ e^-$

9 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (130 \pm 46)^\circ$.

10 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects. Four sets of solutions are obtained with the same fit quality, mass and total width, but with different $e^+ e^-$ partial widths. We quote only the range of values.

11 From a fit to Crystal Ball (OSTERHELD 86) data.

12 From a fit to BES (BAI 02C) data.

$\psi(4040)$ BRANCHING RATIOS

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})

• • • We do not use the following data for averages, fits, limits, etc. • • •

	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
~ 1.0	FELDMAN	77	MRK1	$e^+ e^-$

$\Gamma(D^0 \bar{D}^0)/\Gamma_{\text{total}}$

VALUE

seen

seen

seen

	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
AUBERT	09M	BABR	$e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$	
CRONIN-HEN..09	CLEO		$e^+ e^- \rightarrow D^0 \bar{D}^0$	
PAKHLOVA	08	BELL	$e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$	

$\Gamma(D^+ D^-)/\Gamma_{\text{total}}$

VALUE

seen

seen

seen

	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
AUBERT	09M	BABR	$e^+ e^- \rightarrow D^+ D^- \gamma$	
CRONIN-HEN..09	CLEO		$e^+ e^- \rightarrow D^+ D^-$	
PAKHLOVA	08	BELL	$e^+ e^- \rightarrow D^+ D^- \gamma$	

$\Gamma(D \bar{D})/\Gamma(D^* \bar{D} + \text{c.c.})$

VALUE

0.24±0.05±0.12

	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_5
AUBERT	09M	BABR	$e^+ e^- \rightarrow \gamma D^{(*)} \bar{D}$	

$\Gamma(D^0 \bar{D}^0)/\Gamma(D^*(2007)^0 \bar{D}^0 + \text{c.c.})$

VALUE

0.05±0.03

	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_6
13 GOLDHABER	77	MRK1	$e^+ e^-$	

13 Phase-space factor (p^3) explicitly removed.

$\Gamma(D^*(2007)^0 \bar{D}^0 + \text{c.c.})/\Gamma_{\text{total}}$

VALUE

seen

seen

	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
AUBERT	09M	BABR	$e^+ e^- \rightarrow D^{*0} \bar{D}^0 \gamma$	
CRONIN-HEN..09	CLEO		$e^+ e^- \rightarrow D^{*0} \bar{D}^0$	

$\Gamma(D^*(2010)^+ D^- + \text{c.c.})/\Gamma_{\text{total}}$

VALUE

seen

seen

seen

	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
AUBERT	09M	BABR	$e^+ e^- \rightarrow D^{*+} D^- \gamma$	
CRONIN-HEN..09	CLEO		$e^+ e^- \rightarrow D^{*+} D^-$	
PAKHLOVA	07	BELL	$e^+ e^- \rightarrow D^{*+} D^- \gamma$	

$\Gamma(D^*(2010)^+ D^- + \text{c.c.})/\Gamma(D^*(2007)^0 \bar{D}^0 + \text{c.c.})$

VALUE

0.95±0.09±0.10

	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ_6
AUBERT	09M	BABR	$e^+ e^- \rightarrow \gamma D^* \bar{D}$	

NODE=M072220

NODE=M072W5

NODE=M072W5

→ UNCHECKED ←

OCCUR=2

NODE=M072W5;LINKAGE=AB

NODE=M072W5;LINKAGE=MO

NODE=M072W5;LINKAGE=ST

NODE=M072W5;LINKAGE=SE

NODE=M072225

NODE=M072R4

NODE=M072R4

NODE=M072R14

NODE=M072R14

NODE=M072R15

NODE=M072R15

NODE=M072R12

NODE=M072R12

NODE=M072R1

NODE=M072R1

NODE=M072R;LINKAGE=P

NODE=M072R16

NODE=M072R16

NODE=M072R17

NODE=M072R17

NODE=M072R11

NODE=M072R11

$\Gamma(D^*\bar{D}^*)/\Gamma(D^*\bar{D} + \text{c.c.})$

VALUE	DOCUMENT ID	TECN	COMMENT
0.18±0.14±0.03	AUBERT	09M BABR	$e^+ e^- \rightarrow \gamma D^{(*)}\bar{D}^{(*)}$

 Γ_8/Γ_5 NODE=M072R13
NODE=M072R13 $\Gamma(D^*(2007)^0\bar{D}^*(2007)^0)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
seen	AUBERT	09M BABR	$e^+ e^- \rightarrow D^{*0}\bar{D}^{*0}\gamma$
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^{*0}\bar{D}^{*0}$

 Γ_9/Γ NODE=M072R18
NODE=M072R18 $\Gamma(D^*(2007)^0\bar{D}^*(2007)^0)/\Gamma(D^*(2007)^0\bar{D}^0 + \text{c.c.})$

VALUE	DOCUMENT ID	TECN	COMMENT
32.0±12.0	¹⁴ GOLDHABER	77	MRK1 $e^+ e^-$

 Γ_9/Γ_6 NODE=M072R2
NODE=M072R214 Phase-space factor (p^3) explicitly removed. $\Gamma(D^*(2010)^+D^*(2010)^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
seen	AUBERT	09M BABR	$e^+ e^- \rightarrow D^{*+}D^{*-}\gamma$
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^{*+}D^{*-}$
seen	PAKHLOVA	07 BELL	$e^+ e^- \rightarrow D^{*+}D^{*-}\gamma$

 Γ_{10}/Γ NODE=M072R19
NODE=M072R19 $\Gamma(D^0 D^- \pi^+ + \text{c.c. (excl. } D^*(2007)^0\bar{D}^0 + \text{c.c., } D^*(2010)^+D^- + \text{c.c.)})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	PAKHLOVA	08A BELL	$e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$

 Γ_{12}/Γ NODE=M072R20
NODE=M072R20 $\Gamma(D\bar{D}^* \pi (\text{excl. } D^*\bar{D}^*))/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D\bar{D}^* \pi$

 Γ_{13}/Γ NODE=M072R21
NODE=M072R21 $\Gamma(D^0\bar{D}^{*-} \pi^+ + \text{c.c. (excl. } D^*(2010)^+D^*(2010)^-))/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
seen	PAKHLOVA	09 BELL	$e^+ e^- \rightarrow D^0\bar{D}^{*-} \pi^+ \gamma$

 Γ_{14}/Γ NODE=M072R22
NODE=M072R22 $\Gamma(D_s^+ D_s^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
seen	PAKHLOVA	11 BELL	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
seen	DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D_s^+ D_s^-$

 Γ_{15}/Γ NODE=M072R23
NODE=M072R23 $\Gamma(J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<4	90	COAN	06 CLEO	$3.97-4.06 e^+ e^- \rightarrow \text{hadrons}$

 Γ_{17}/Γ NODE=M072R01
NODE=M072R01 $\Gamma(J/\psi \pi^0 \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2	90	COAN	06 CLEO	$3.97-4.06 e^+ e^- \rightarrow \text{hadrons}$

 Γ_{18}/Γ NODE=M072R02
NODE=M072R02 $\Gamma(J/\psi \eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
5.2±0.5±0.5	15 ABLIKIM	12K BES3	$e^+ e^- \rightarrow \ell^+ \ell^- 2\gamma$	

 Γ_{19}/Γ NODE=M072R03
NODE=M072R03

• • • We do not use the following data for averages, fits, limits, etc. • • •

<7 90 COAN 06 CLEO $3.97-4.06 e^+ e^- \rightarrow \text{hadrons}$ 15 ABLIKIM 12K measure $\sigma(e^+ e^- \rightarrow J/\psi \eta) = 32.1 \pm 2.8 \pm 1.3 \text{ pb}$. They assume the $\eta J/\psi$ fully originates from $\psi(4040)$ decays.

| NODE=M072R03;LINKAGE=AB

 $\Gamma(J/\psi \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<0.28 (CL = 90%)	[$<2 \times 10^{-3}$ (CL = 90%) OUR 2012 BEST LIMIT]			

 Γ_{20}/Γ NODE=M072R04
NODE=M072R04<0.28 90 ¹⁶ ABLIKIM 12K BES3 $e^+ e^- \rightarrow \ell^+ \ell^- 2\gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<2 90 COAN 06 CLEO $3.97-4.06 e^+ e^- \rightarrow \text{hadrons}$ 16 ABLIKIM 12K measure $\sigma(e^+ e^- \rightarrow J/\psi \pi^0) < 1.6 \text{ pb}$. They assume the $\eta J/\psi$ fully originates from $\psi(4040)$ decays.

| NODE=M072R04;LINKAGE=AB

$\Gamma(J/\psi\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{21}/Γ
<2	90	COAN	06	CLEO 3.97–4.06 $e^+e^- \rightarrow$ hadrons	NODE=M072R05 NODE=M072R05

 $\Gamma(\chi_{c1}\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{22}/Γ
<11	90	COAN	06	CLEO 3.97–4.06 $e^+e^- \rightarrow$ hadrons	NODE=M072R06 NODE=M072R06

 $\Gamma(\chi_{c2}\gamma)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{23}/Γ
<17	90	COAN	06	CLEO 3.97–4.06 $e^+e^- \rightarrow$ hadrons	NODE=M072R07 NODE=M072R07

 $\Gamma(\chi_{c1}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{24}/Γ
<11	90	COAN	06	CLEO 3.97–4.06 $e^+e^- \rightarrow$ hadrons	NODE=M072R08 NODE=M072R08

 $\Gamma(\chi_{c2}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{25}/Γ
<32	90	COAN	06	CLEO 3.97–4.06 $e^+e^- \rightarrow$ hadrons	NODE=M072R09 NODE=M072R09

 $\Gamma(h_c(1P)\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{26}/Γ
<3	90	17 PEDLAR	11	CLEO $e^+e^- \rightarrow h_c(1P)\pi^+\pi^-$	NODE=M072R24 NODE=M072R24

¹⁷ From several values of \sqrt{s} near the peak of the $\psi(4040)$, PEDLAR 11 measures $\sigma(e^+e^- \rightarrow h_c(1P)\pi^+\pi^-) = 1.0 \pm 8.0 \pm 5.4 \pm 0.2$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.

 $\Gamma(\phi\pi^+\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{27}/Γ
<3	90	COAN	06	CLEO 3.97–4.06 $e^+e^- \rightarrow$ hadrons	NODE=M072R10 NODE=M072R10

 $\psi(4040)$ REFERENCES

ABLIKIM	12K	PR D86 071101	M. Ablikim <i>et al.</i>	(BES III Collab.)
PAKHLOVA	11	PR D83 011101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PEDLAR	11	PRL 107 041803	T. Pedlar <i>et al.</i>	(CLEO Collab.)
DEL-AMO-SA...	10N	PR D82 052004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
MO	10	PR D82 077501	X.H. Mo, C.Z. Yuan, P. Wang	(BHEP)
AUBERT	09M	PR D79 092001	B. Aubert <i>et al.</i>	(BABAR Collab.)
CRONIN-HEN...	09	PR D80 072001	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)
PAKHLOVA	09	PR D80 091101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
ABLIKIM	08D	PL B660 315	M. Ablikim <i>et al.</i>	(BES Collab.)
PAKHLOVA	08	PR D77 011103	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA	08A	PRL 100 062001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA	07	PRL 98 092001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
COAN	06	PRL 96 162003	T.E. Coan <i>et al.</i>	(CLEO Collab.)
SETH	05A	PR D72 017501	K.K. Seth	
BAI	02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI	00	PRL 84 594	J.Z. Bai <i>et al.</i>	(BES Collab.)
OSTERHELD	86	SLAC-PUB-4160	A. Osterheld <i>et al.</i>	(SLAC Crystal Ball Collab.)
BRANDELIK	78C	PL 76B 361	R. Brandelik <i>et al.</i>	(DASP Collab.)
Also		ZPHY C1 233	R. Brandelik <i>et al.</i>	(DASP Collab.)
FELDMAN	77	PRPL 33C 285	G.J. Feldman, M.L. Perl	(LBL, SLAC)
GOLDHABER	77	PL 69B 503	G. Goldhaber <i>et al.</i>	(Mark I Collab.)

NODE=M072

REFID=54738
REFID=53638
REFID=16787
REFID=53532
REFID=53540
REFID=52724
REFID=53114
REFID=53143
REFID=52142
REFID=52132
REFID=52134
REFID=51628
REFID=51075
REFID=50813
REFID=50506
REFID=50503
REFID=51064
REFID=22232
REFID=22114
REFID=22062
REFID=11434

NODE=M191

X(4050) $^\pm$ $I(J^P) = ?(?)$

OMITTED FROM SUMMARY TABLE

Observed by MIZUK 08 in the $\pi^+ \chi_{c1}(1P)$ invariant mass distribution in $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$ decays. Not seen by LEES 12B in this same mode after accounting for $K\pi$ resonant mass and angular structure.

NODE=M191

X(4050) $^\pm$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
4051±14$^{+20}_{-41}$	¹ MIZUK	08	BELL $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$

¹ From a Dalitz plot analysis with two Breit-Wigner amplitudes.

NODE=M191M

NODE=M191M

NODE=M191M;LINKAGE=MI

NODE=M191W

NODE=M191W

NODE=M191W;LINKAGE=MI

NODE=M191215;NODE=M191

X(4050) $^\pm$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad \pi^+ \chi_{c1}(1P)$	seen

DESIG=1

X(4050) $^\pm$ BRANCHING RATIOS

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
seen	³ MIZUK	08	BELL $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

NODE=M191225

NODE=M191R01
NODE=M191R01not seen ⁴ LEES 12B BABR $B \rightarrow K\pi \chi_{c1}(1P)$

NODE=M191R01;LINKAGE=MI

³ With a product branching fraction measurement of $B(\bar{B}^0 \rightarrow K^- X(4050)^+) \times B(X(4050)^+ \rightarrow \pi^+ \chi_{c1}(1P)) = (3.0^{+1.5+3.7}_{-0.8-1.6}) \times 10^{-5}$.⁴ With a product branching fraction limit of $B(\bar{B}^0 \rightarrow X(4050)^+ K^-) \times B(X(4050)^+ \rightarrow \chi_{c1} \pi^+) < 1.8 \times 10^{-5}$ at 90% CL.

NODE=M191R01;LINKAGE=LE

X(4050) $^\pm$ REFERENCES

LEES MIZUK	12B 08	PR D85 052003 PR D78 072004	J.P. Lees <i>et al.</i> R. Mizuk <i>et al.</i>	(BABAR Collab.) (BELLE Collab.)
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NODE=M191

REFID=54042
REFID=52535

X(4140) $I^G(J^{PC}) = 0^+(?^+)$

OMITTED FROM SUMMARY TABLE

Needs confirmation.

Seen by AALTONEN 09AH in the $B^+ \rightarrow X K^+$, $X \rightarrow J/\psi\phi$.Not seen by SHEN 10 in $\gamma\gamma \rightarrow J/\psi\phi$ or AAIJ 12AA in $B^+ \rightarrow J/\psi\phi K^+$.

NODE=M193

X(4140) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4143.0 \pm 2.9 \pm 1.2	14 \pm 5	1 AALTONEN 09AH CDF	$B^+ \rightarrow J/\psi\phi K^+$	
1 Statistical significance of 3.8 σ .				

NODE=M193M

NODE=M193M

NODE=M193M;LINKAGE=AA

NODE=M193W

NODE=M193W

NODE=M193W;LINKAGE=AA

NODE=M193215;NODE=M193

X(4140) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
11.7 \pm 8.3 \pm 3.7	14 \pm 5	2 AALTONEN 09AH CDF	$B^+ \rightarrow J/\psi\phi K^+$	
2 Statistical significance of 3.8 σ .				

X(4140) DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $J/\psi\phi$	not seen
Γ_2 $\gamma\gamma$	not seen

X(4140) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\gamma\gamma) \times \Gamma(J/\psi\phi)/\Gamma_{\text{total}}$	$\Gamma_2\Gamma_1/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •	
< 41 90 ³ SHEN 10 BELL $10.6 e^+ e^- \rightarrow e^+ e^- J/\psi\phi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •	
< 6 90 ⁴ SHEN 10 BELL $10.6 e^+ e^- \rightarrow e^+ e^- J/\psi\phi$	
³ For $J^P = 0^+$.	
⁴ For $J^P = 2^+$.	

DESIG=1

DESIG=2

NODE=M193220

NODE=M193G01
NODE=M193G01

OCCUR=2

NODE=M193G01;LINKAGE=S0
NODE=M193G01;LINKAGE=S2

NODE=M193225

NODE=M193R01
NODE=M193R01

NODE=M193R01;LINKAGE=AI

NODE=M193R01;LINKAGE=AA

NODE=M193R02
NODE=M193R02

NODE=M193

REFID=54263

REFID=53235

REFID=52968

X(4140) BRANCHING RATIOS

$\Gamma(J/\psi\phi)/\Gamma_{\text{total}}$	Γ_1/Γ
not seen [seen OUR 2012 BEST LIMIT]	
not seen 5 AAIJ 12AA LHCb $pp \rightarrow B^+ X$ at 7 TeV	
• • • We do not use the following data for averages, fits, limits, etc. • • •	
seen 14 \pm 5 ⁶ AALTONEN 09AH CDF $B^+ \rightarrow J/\psi\phi K^+$	
⁵ Reported $B(B^+ \rightarrow X(4140) K^+) \cdot B(X(4140) \rightarrow J/\psi\phi) / B(B^+ \rightarrow J/\psi\phi K^+) < 0.07$ at 90% CL.	
⁶ Statistical significance of 3.8 σ .	

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$	Γ_2/Γ
not seen	
SHEN 10 BELL $10.6 e^+ e^- \rightarrow e^+ e^- J/\psi\phi$	

X(4140) REFERENCES

AAIJ 12AA PR D85 091103	R. Aaij <i>et al.</i>	(LHCb Collab.)
SHEN 10 PRL 104 112004	C.P. Shen <i>et al.</i>	(BELLE Collab.)
AALTONEN 09AH PRL 102 242002	T. Aaltonen <i>et al.</i>	(CDF Collab.)

NODE=M025

 $\psi(4160)$ $I^G(J^{PC}) = 0^-(1^- -)$ **$\psi(4160)$ MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
4153 ± 3 OUR ESTIMATE			
4191.7± 6.5	1 ABLIKIM	08D BES2	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •			
4193 ± 7	2 MO	10 RVUE	$e^+ e^- \rightarrow$ hadrons
4151 ± 4	3 SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
4155 ± 5	4 SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
4159 ± 20	BRANDELIK	78C DASP	$e^+ e^-$
1 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (293 \pm 57)^\circ$.			
2 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.			
3 From a fit to Crystal Ball (OSTERHELD 86) data.			
4 From a fit to BES (BAI 02C) data.			

 $\psi(4160)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
103 ± 8 OUR ESTIMATE			
71.8±12.3	5 ABLIKIM	08D BES2	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •			
79 ± 14	6 MO	10 RVUE	$e^+ e^- \rightarrow$ hadrons
107 ± 10	7 SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
107 ± 16	8 SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
78 ± 20	BRANDELIK	78C DASP	$e^+ e^-$
5 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (293 \pm 57)^\circ$.			
6 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.			
7 From a fit to Crystal Ball (OSTERHELD 86) data.			
8 From a fit to BES (BAI 02C) data.			

 $\psi(4160)$ DECAY MODES

Due to the complexity of the $c\bar{c}$ threshold region, in this listing, “seen” (“not seen”) means that a cross section for the mode in question has been measured at effective \sqrt{s} near this particle’s central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in \sqrt{s} or absence thereof. See mode listing(s) for details and references.

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 e^+ e^-$	$(8.1 \pm 0.9) \times 10^{-6}$	
$\Gamma_2 D\bar{D}$	seen	
$\Gamma_3 D^0\bar{D}^0$	seen	
$\Gamma_4 D^+D^-$	seen	
$\Gamma_5 D^*\bar{D} + \text{c.c.}$	seen	
$\Gamma_6 D^*(2007)^0\bar{D}^0 + \text{c.c.}$	seen	
$\Gamma_7 D^*(2010)^+D^- + \text{c.c.}$	seen	
$\Gamma_8 D^*\bar{D}^*$	seen	
$\Gamma_9 D^*(2007)^0\bar{D}^*(2007)^0$	seen	
$\Gamma_{10} D^*(2010)^+D^*(2010)^-$	seen	
$\Gamma_{11} D^0D^-\pi^+ + \text{c.c. (excl.)}$ $D^*(2007)^0\bar{D}^0 + \text{c.c.},$ $D^*(2010)^+D^- + \text{c.c.})$	not seen	
$\Gamma_{12} D\bar{D}^*\pi + \text{c.c. (excl. } D^*\bar{D}^*)$	seen	

NODE=M025M

NODE=M025M

→ UNCHECKED ←

OCCUR=2

NODE=M025M;LINKAGE=AB

NODE=M025M;LINKAGE=MO

NODE=M025M;LINKAGE=ST

NODE=M025M;LINKAGE=SE

NODE=M025W

NODE=M025W

→ UNCHECKED ←

OCCUR=2

NODE=M025W;LINKAGE=AB

NODE=M025W;LINKAGE=MO

NODE=M025W;LINKAGE=ST

NODE=M025W;LINKAGE=SE

NODE=M025215;NODE=M025

NODE=M025

DESIG=1

DESIG=15;OUR EVAL;→ UNCHECKED ←

DESIG=16

DESIG=17

DESIG=18;OUR EVAL;→ UNCHECKED ←

DESIG=19

DESIG=20

DESIG=21;OUR EVAL;→ UNCHECKED ←

DESIG=22

DESIG=23

DESIG=24

DESIG=25

Γ_{13}	$D^0 D^{*-} \pi^+ + c.c.$ (excl. $D^*(2010)^+ D^*(2010)^-$)	not seen		DESIG=26
Γ_{14}	$D_s^+ D_s^-$	not seen		DESIG=27
Γ_{15}	$D_s^{*+} D_s^- + c.c.$	seen		DESIG=28
Γ_{16}	$J/\psi \pi^+ \pi^-$	< 3	$\times 10^{-3}$	90%
Γ_{17}	$J/\psi \pi^0 \pi^0$	< 3	$\times 10^{-3}$	90%
Γ_{18}	$J/\psi K^+ K^-$	< 2	$\times 10^{-3}$	90%
Γ_{19}	$J/\psi \eta$	< 8	$\times 10^{-3}$	90%
Γ_{20}	$J/\psi \pi^0$	< 1	$\times 10^{-3}$	90%
Γ_{21}	$J/\psi \eta'$	< 5	$\times 10^{-3}$	90%
Γ_{22}	$J/\psi \pi^+ \pi^- \pi^0$	< 1	$\times 10^{-3}$	90%
Γ_{23}	$\psi(2S) \pi^+ \pi^-$	< 4	$\times 10^{-3}$	90%
Γ_{24}	$\chi_{c1} \gamma$	< 7	$\times 10^{-3}$	90%
Γ_{25}	$\chi_{c2} \gamma$	< 1.3	%	90%
Γ_{26}	$\chi_{c1} \pi^+ \pi^- \pi^0$	< 2	$\times 10^{-3}$	90%
Γ_{27}	$\chi_{c2} \pi^+ \pi^- \pi^0$	< 8	$\times 10^{-3}$	90%
Γ_{28}	$h_c(1P) \pi^+ \pi^-$	< 5	$\times 10^{-3}$	90%
Γ_{29}	$h_c(1P) \pi^0 \pi^0$	< 2	$\times 10^{-3}$	90%
Γ_{30}	$h_c(1P) \eta$	< 2	$\times 10^{-3}$	90%
Γ_{31}	$h_c(1P) \pi^0$	< 4	$\times 10^{-4}$	90%
Γ_{32}	$\phi \pi^+ \pi^-$	< 2	$\times 10^{-3}$	90%

$\psi(4160)$ PARTIAL WIDTHS

$\Gamma(e^+ e^-)$

VALUE (keV)

0.83±0.07 OUR ESTIMATE

0.48±0.22

• • • We do not use the following data for averages, fits, limits, etc. • • •

	DOCUMENT ID	TECN	COMMENT	Γ_1
9 ABLIKIM	08D BES2	$e^+ e^- \rightarrow$ hadrons		
10 MO	10 RVUE	$e^+ e^- \rightarrow$ hadrons		
11 SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons		
12 SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons		
BRANDELIK	78C DASP	$e^+ e^-$		

9 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (293 \pm 57)^\circ$.

10 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects. Four sets of solutions are obtained with the same fit quality, mass and total width, but with different $e^+ e^-$ partial widths. We quote only the range of values.

11 From a fit to Crystal Ball (OSTERHELD 86) data.

12 From a fit to BES (BAI 02C) data.

$\psi(4160)$ BRANCHING RATIOS

$\Gamma(D\bar{D})/\Gamma(D^*\bar{D}^*)$

VALUE

0.02±0.03±0.02

DOCUMENT ID	TECN	COMMENT	Γ_2/Γ_8
AUBERT	09M BABR	$e^+ e^- \rightarrow \gamma D^{(*)}\bar{D}^{(*)}$	

$\Gamma(D^0\bar{D}^0)/\Gamma_{\text{total}}$

VALUE

seen

seen

• • • We do not use the following data for averages, fits, limits, etc. • • •

DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^0\bar{D}^0$	
PAKHLOVA 08	BELL	$e^+ e^- \rightarrow D^0\bar{D}^0\gamma$	

DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^+ D^-$	
PAKHLOVA 08	BELL	$e^+ e^- \rightarrow D^+ D^- \gamma$	

$\Gamma(D^+ D^-)/\Gamma_{\text{total}}$

VALUE

seen

seen

• • • We do not use the following data for averages, fits, limits, etc. • • •

DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^+ D^-$	
PAKHLOVA 08	BELL	$e^+ e^- \rightarrow D^+ D^- \gamma$	

NODE=M025220

NODE=M025W1

NODE=M025W1

→ UNCHECKED ←

OCCUR=2

NODE=M025W1;LINKAGE=AB

NODE=M025W1;LINKAGE=MO

NODE=M025W1;LINKAGE=ST

NODE=M025W1;LINKAGE=SE

NODE=M025225

NODE=M025R14

NODE=M025R14

NODE=M025R16

NODE=M025R16

NODE=M025R17

NODE=M025R17

$\Gamma(D^*(2007)^0 \bar{D}^0 + \text{c.c.})/\Gamma_{\text{total}}$	Γ_6/Γ	NODE=M025R18 NODE=M025R18
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
seen	AUBERT 09M BABR $e^+ e^- \rightarrow D^{*0} \bar{D}^0 \gamma$	
seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*0} \bar{D}^0$	
$\Gamma(D^*(2010)^+ D^- + \text{c.c.})/\Gamma_{\text{total}}$	Γ_7/Γ	NODE=M025R19 NODE=M025R19
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
seen	AUBERT 09M BABR $e^+ e^- \rightarrow D^{*+} D^- \gamma$	
seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*+} D^-$	
seen	PAKHLOVA 07 BELL $e^+ e^- \rightarrow D^{*+} D^- \gamma$	
$\Gamma(D^* \bar{D} + \text{c.c.})/\Gamma(D^* \bar{D}^*)$	Γ_5/Γ_8	NODE=M025R15 NODE=M025R15
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
0.34 ± 0.14 ± 0.05	AUBERT 09M BABR $e^+ e^- \rightarrow \gamma D^{(*)} \bar{D}^{(*)}$	
$\Gamma(D^*(2007)^0 \bar{D}^*(2007)^0)/\Gamma_{\text{total}}$	Γ_9/Γ	NODE=M025R20 NODE=M025R20
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
seen	AUBERT 09M BABR $e^+ e^- \rightarrow D^{*0} \bar{D}^{*0} \gamma$	
seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*0} \bar{D}^{*0}$	
$\Gamma(D^*(2010)^+ D^*(2010)^-)/\Gamma_{\text{total}}$	Γ_{10}/Γ	NODE=M025R21 NODE=M025R21
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
seen	AUBERT 09M BABR $e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$	
seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*+} D^{*-}$	
seen	PAKHLOVA 07 BELL $e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$	
$\Gamma(D^0 D^- \pi^+ + \text{c.c. (excl. } D^*(2007)^0 \bar{D}^0 + \text{c.c., } D^*(2010)^+ D^- + \text{c.c.}))/\Gamma_{\text{total}}$	Γ_{11}/Γ	NODE=M025R22 NODE=M025R22
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
not seen	PAKHLOVA 08A BELL $e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$	
$\Gamma(D \bar{D}^* \pi + \text{c.c. (excl. } D^* \bar{D}^*))/\Gamma_{\text{total}}$	Γ_{12}/Γ	NODE=M025R23 NODE=M025R23
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D \bar{D}^* \pi$	
$\Gamma(D^0 D^{*-} \pi^+ + \text{c.c. (excl. } D^*(2010)^+ D^*(2010)^-))/\Gamma_{\text{total}}$	Γ_{13}/Γ	NODE=M025R24 NODE=M025R24
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
not seen	PAKHLOVA 09 BELL $e^+ e^- \rightarrow D^0 D^{*-} \pi^+ \gamma$	
$\Gamma(D_s^+ D_s^-)/\Gamma_{\text{total}}$	Γ_{14}/Γ	NODE=M025R25 NODE=M025R25
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
not seen	PAKHLOVA 11 BELL $e^+ e^- \rightarrow D_s^+ D_s^- \gamma$	
not seen	DEL-AMO-SA..10N BABR $e^+ e^- \rightarrow D_s^+ D_s^- \gamma$	
not seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D_s^+ D_s^-$	
$\Gamma(D_s^+ D_s^- + \text{c.c.})/\Gamma_{\text{total}}$	Γ_{15}/Γ	NODE=M025R26 NODE=M025R26
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
seen	PAKHLOVA 11 BELL $e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$	
seen	DEL-AMO-SA..10N BABR $e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$	
seen	CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D_s^{*+} D_s^-$	
$\Gamma(J/\psi \pi^+ \pi^-)/\Gamma_{\text{total}}$	Γ_{16}/Γ	NODE=M025R01 NODE=M025R01
<u>VALUE (units 10^{-3})</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
<3 90	COAN 06 CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons	
$\Gamma(J/\psi \pi^0 \pi^0)/\Gamma_{\text{total}}$	Γ_{17}/Γ	NODE=M025R02 NODE=M025R02
<u>VALUE (units 10^{-3})</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
<3 90	COAN 06 CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons	
$\Gamma(J/\psi K^+ K^-)/\Gamma_{\text{total}}$	Γ_{18}/Γ	NODE=M025R03 NODE=M025R03
<u>VALUE (units 10^{-3})</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
<2 90	COAN 06 CLEO 4.12–4.2 $e^+ e^- \rightarrow$ hadrons	

$\Gamma(J/\psi\eta)/\Gamma_{\text{total}}$	Γ_{19}/Γ	NODE=M025R04 NODE=M025R04
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<8	90	
$\Gamma(J/\psi\pi^0)/\Gamma_{\text{total}}$	Γ_{20}/Γ	NODE=M025R05 NODE=M025R05
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<1	90	
$\Gamma(J/\psi\eta')/\Gamma_{\text{total}}$	Γ_{21}/Γ	NODE=M025R06 NODE=M025R06
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<5	90	
$\Gamma(J/\psi\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$	Γ_{22}/Γ	NODE=M025R07 NODE=M025R07
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<1	90	
$\Gamma(\psi(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{23}/Γ	NODE=M025R08 NODE=M025R08
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<4	90	
$\Gamma(\chi_{c1}\gamma)/\Gamma_{\text{total}}$	Γ_{24}/Γ	NODE=M025R09 NODE=M025R09
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<7	90	
$\Gamma(\chi_{c2}\gamma)/\Gamma_{\text{total}}$	Γ_{25}/Γ	NODE=M025R10 NODE=M025R10
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<13	90	
$\Gamma(\chi_{c1}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$	Γ_{26}/Γ	NODE=M025R11 NODE=M025R11
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<2	90	
$\Gamma(\chi_{c2}\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$	Γ_{27}/Γ	NODE=M025R12 NODE=M025R12
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{COAN}} \quad \frac{\text{TECN}}{\text{CLEO}} \quad \frac{\text{COMMENT}}{4.12-4.2 e^+ e^- \rightarrow \text{hadrons}}$	
<8	90	
$\Gamma(h_c(1P)\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{28}/Γ	NODE=M025R27 NODE=M025R27
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{13 \text{ PEDLAR}} \quad \frac{\text{TECN}}{11 \text{ CLEO}} \quad \frac{\text{COMMENT}}{e^+ e^- \rightarrow h_c(1P)\pi^+\pi^-}$	
<5	90	
13 At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+ e^- \rightarrow h_c(1P)\pi^+\pi^-) = 15.6 \pm 2.3 \pm 1.9 \pm 3.0$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.		
$\Gamma(h_c(1P)\pi^0\pi^0)/\Gamma_{\text{total}}$	Γ_{29}/Γ	NODE=M025R28 NODE=M025R28
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{14 \text{ PEDLAR}} \quad \frac{\text{TECN}}{11 \text{ CLEO}} \quad \frac{\text{COMMENT}}{e^+ e^- \rightarrow h_c(1P)\pi^0\pi^0}$	
<2	90	
14 At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+ e^- \rightarrow h_c(1P)\pi^0\pi^0) = 3.0 \pm 3.3 \pm 1.1 \pm 0.6$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.		
$\Gamma(h_c(1P)\eta)/\Gamma_{\text{total}}$	Γ_{30}/Γ	NODE=M025R29 NODE=M025R29
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{15 \text{ PEDLAR}} \quad \frac{\text{TECN}}{11 \text{ CLEO}} \quad \frac{\text{COMMENT}}{e^+ e^- \rightarrow h_c(1P)\eta}$	
<2	90	
15 At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+ e^- \rightarrow h_c(1P)\eta) = 4.7 \pm 1.7 \pm 1.0 \pm 0.9$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.		
$\Gamma(h_c(1P)\pi^0)/\Gamma_{\text{total}}$	Γ_{31}/Γ	NODE=M025R30 NODE=M025R30
$\frac{\text{VALUE (units } 10^{-3})}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{16 \text{ PEDLAR}} \quad \frac{\text{TECN}}{11 \text{ CLEO}} \quad \frac{\text{COMMENT}}{e^+ e^- \rightarrow h_c(1P)\pi^0}$	
<0.4	90	
16 At $\sqrt{s} = 4170$ MeV, PEDLAR 11 measures $\sigma(e^+ e^- \rightarrow h_c(1P)\pi^0) = -0.7 \pm 1.8 \pm 0.7 \pm 0.1$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.		

$\Gamma(\phi\pi^+\pi^-)/\Gamma_{\text{total}}$			Γ_{32}/Γ		
<u>VALUE</u> (units 10^{-3})	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2	90	COAN	06	CLEO	4.12–4.2 $e^+e^- \rightarrow \text{hadrons}$

$\psi(4160)$ REFERENCES

PAKHLOVA 11	PR D83 011101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PEDLAR 11	PRL 107 041803	T. Pedlar <i>et al.</i>	(CLEO Collab.)
DEL-AMO-SA... 10N	PR D82 052004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
MO 10	PR D82 077501	X.H. Mo, C.Z. Yuan, P. Wang	(BHEP)
AUBERT 09M	PR D79 092001	B. Aubert <i>et al.</i>	(BABAR Collab.)
CRONIN-HEN... 09	PR D80 072001	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)
PAKHLOVA 09	PR D80 091101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
ABLIKIM 08D	PL B660 315	M. Ablikim <i>et al.</i>	(BES Collab.)
PAKHLOVA 08	PR D77 011103	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA 08A	PRL 100 062001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA 07	PR D98 092001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
COAN 06	PRL 96 162003	T.E. Coan <i>et al.</i>	(CLEO Collab.)
SETH 05A	PR D72 017501	K.K. Seth	
BAI 02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI 00	PRL 84 594	J.Z. Bai <i>et al.</i>	(BES Collab.)
OSTERHELD 86	SLAC-PUB-4160	A. Osterheld <i>et al.</i>	(SLAC Crystal Ball Collab.)
BRANDELIK 78C	PL 76B 361	R. Brandelik <i>et al.</i>	(DASP Collab.)

$X(4160)$

$$I^G(J^{PC}) = ??(??)$$

OMMITTED FROM SUMMARY TABLE

Seen by PAKHLOV 08 in $e^+e^- \rightarrow J/\psi X, X \rightarrow D^*\bar{D}^*$

$X(4160)$ MASS

<u>VALUE</u> (MeV)	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4156$^{+25}_{-20}$$\pm 15$	24	PAKHLOV	08	BELL $e^+e^- \rightarrow J/\psi X$

$X(4160)$ WIDTH

<u>VALUE</u> (MeV)	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
139$^{+111}_{-61}$$\pm 21$	24	PAKHLOV	08	BELL $e^+e^- \rightarrow J/\psi X$

$X(4160)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 D\bar{D}$	not seen
$\Gamma_2 D^*\bar{D} + \text{c.c.}$	not seen
$\Gamma_3 D^*\bar{D}^*$	seen

$X(4160)$ BRANCHING RATIOS

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.09	90	PAKHLOV	08	BELL $e^+e^- \rightarrow J/\psi X$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.22	90	PAKHLOV	08	BELL $e^+e^- \rightarrow J/\psi X$

$X(4160)$ REFERENCES

PAKHLOV 08	PRL 100 202001	P. Pakhlov <i>et al.</i>	(BELLE Collab.)
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NODE=M025R13
NODE=M025R13

NODE=M025

REFID=53638
REFID=16787
REFID=53532
REFID=53540
REFID=52724
REFID=53114
REFID=53143
REFID=52142
REFID=52132
REFID=52134
REFID=51628
REFID=51075
REFID=50813
REFID=50506
REFID=50503
REFID=51064
REFID=22232

NODE=M190

NODE=M190

NODE=M190M

NODE=M190W

NODE=M190W

NODE=M190215; NODE=M190

DESIG=1;OUR EVAL; \rightarrow UNCHECKED
DESIG=2;OUR EVAL; \rightarrow UNCHECKED
DESIG=3;OUR EVAL; \rightarrow UNCHECKED

NODE=M190225

NODE=M190R01
NODE=M190R01

NODE=M190R02
NODE=M190R02

NODE=M190

REFID=52302

X(4250) $^\pm$ $I(J^P) = ?(?)$

OMITTED FROM SUMMARY TABLE

Observed by MIZUK 08 in the $\pi^+ \chi_{c1}(1P)$ invariant mass distribution in $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$ decays. Not seen by LEES 12B in this same mode after accounting for $K\pi$ resonant mass and angular structure.

NODE=M192

X(4250) $^\pm$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
4248 $+44 +180$ $-29 -35$	¹ MIZUK	08	BELL $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$

¹ From a Dalitz plot analysis with two Breit-Wigner amplitudes.

NODE=M192

X(4250) $^\pm$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
177 $+54 +316$ $-39 -61$	² MIZUK	08	BELL $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$

² From a Dalitz plot analysis with two Breit-Wigner amplitudes.

NODE=M192M

NODE=M192M

NODE=M192M;LINKAGE=MI

NODE=M192W

NODE=M192W

NODE=M192W;LINKAGE=MI

NODE=M192215;NODE=M192

X(4250) $^\pm$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad \pi^+ \chi_{c1}(1P)$	seen

DESIG=1

X(4250) $^\pm$ BRANCHING RATIOS

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
seen	³ MIZUK	08	BELL $\bar{B}^0 \rightarrow K^- \pi^+ \chi_{c1}(1P)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

NODE=M192225

NODE=M192R01
NODE=M192R01not seen ⁴ LEES 12B BABR $B \rightarrow K\pi \chi_{c1}(1P)$

NODE=M192R01;LINKAGE=MI

³ With a product branching fraction measurement of $B(\bar{B}^0 \rightarrow K^- X(4250)^+) \times B(X(4250)^+ \rightarrow \pi^+ \chi_{c1}(1P)) = (4.0^{+2.3+19.7}_{-0.9-0.5}) \times 10^{-5}$.⁴ With a product branching fraction limit of $B(\bar{B}^0 \rightarrow X(4250)^+ K^-) \times B(X(4250)^+ \rightarrow \chi_{c1} \pi^+) < 4.0 \times 10^{-5}$ at 90% CL.

NODE=M192R01;LINKAGE=LE

X(4250) $^\pm$ REFERENCES

LEES MIZUK	12B 08	PR D85 052003 PR D78 072004	J.P. Lees <i>et al.</i> R. Mizuk <i>et al.</i>	(BABAR Collab.) (BELLE Collab.)
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NODE=M192

REFID=54042
REFID=52535

X(4260) $I^G(J^{PC}) = ?^?(1^{--})$

Seen in radiative return from e^+e^- collisions at $\sqrt{s} = 9.54\text{--}10.58$ GeV by AUBERT,B 05I, HE 06B, and YUAN 07, and in e^+e^- collisions at $\sqrt{s} \approx 4.26$ GeV by COAN 06. Possibly seen by AUBERT 06 in $B^- \rightarrow K^-\pi^+\pi^- J/\psi$. See also the mini-review under the $X(3872)$. (See the index for the page number.)

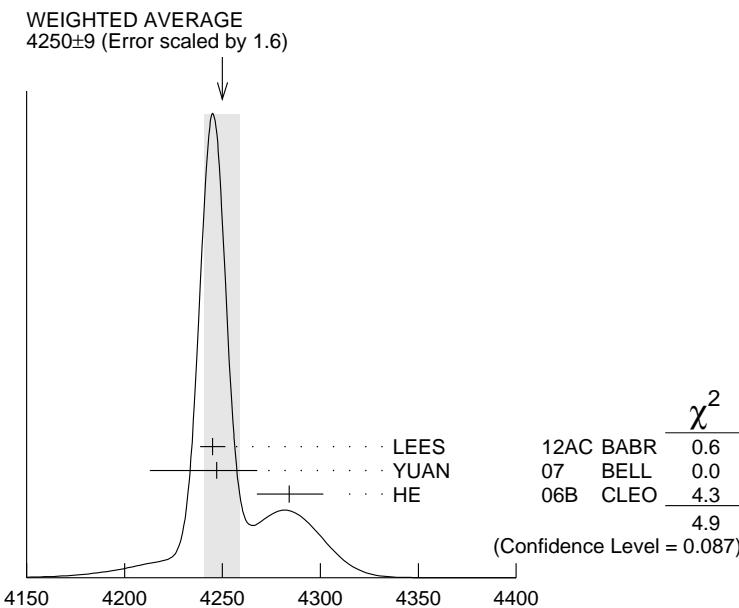
X(4260) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
4250±9 OUR AVERAGE				Error includes scale factor of 1.6. See the ideogram below.
[4263 ⁺⁸ ₋₉ MeV OUR 2012 AVERAGE]				Scale factor = 1.1]
4245±5±4	1 LEES	12AC BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	
4247±12 ⁺¹⁷ ₋₃₂	2 YUAN	07 BELL	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	
4284 ⁺¹⁷ ₋₁₆ ±4 13.6	HE	06B CLEO	9.4–10.6 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	
• • •	We do not use the following data for averages, fits, limits, etc. • • •			
4259±8 ⁺² ₋₆ 125	3 AUBERT,B 05I	BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	

1 From a single-resonance fit. Supersedes AUBERT,B 05I.

2 From a two-resonance fit.

3 From a single-resonance fit. Two interfering resonances are not excluded. Superseded by LEES 12AC.

**X(4260) MASS (MeV)**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
108±12 OUR AVERAGE				
[95 ± 14 MeV OUR 2012 AVERAGE]				
114 ⁺¹⁶ ₋₁₅ ±7	4 LEES	12AC BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	
108±19±10	5 YUAN	07 BELL	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	
73 ⁺³⁹ ₋₂₅ ±5 13.6	HE	06B CLEO	9.4–10.6 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	
• • •	We do not use the following data for averages, fits, limits, etc. • • •			
88±23 ⁺⁶ ₋₄ 125	6 AUBERT,B 05I	BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$	

4 From a single-resonance fit. Supersedes AUBERT,B 05I.

5 From a two-resonance fit.

6 From a single-resonance fit. Two interfering resonances are not excluded. Superseded by LEES 12AC.

NODE=M074M

NODE=M074M

NEW

NODE=M074M;LINKAGE=LE

NODE=M074M;LINKAGE=YU

NODE=M074M;LINKAGE=AU

NODE=M074W

NODE=M074W

NEW

NODE=M074W;LINKAGE=LE

NODE=M074W;LINKAGE=YU

NODE=M074W;LINKAGE=AU

X(4260) DECAY MODES

NODE=M074215;NODE=M074

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	
$\Gamma_2 J/\psi \pi^+ \pi^-$	seen
$\Gamma_3 J/\psi f_0(980), f_0(980) \rightarrow \pi^+ \pi^-$	seen
$\Gamma_4 J/\psi \pi^0 \pi^0$	seen
$\Gamma_5 J/\psi K^+ K^-$	seen
$\Gamma_6 J/\psi \eta$	not seen
$\Gamma_7 J/\psi \pi^0$	not seen
$\Gamma_8 J/\psi \eta'$	not seen
$\Gamma_9 J/\psi \pi^+ \pi^- \pi^0$	not seen
$\Gamma_{10} J/\psi \eta \eta$	not seen
$\Gamma_{11} \psi(2S) \pi^+ \pi^-$	not seen
$\Gamma_{12} \psi(2S) \eta$	not seen
$\Gamma_{13} \chi_{c0} \omega$	not seen
$\Gamma_{14} \chi_{c1} \gamma$	not seen
$\Gamma_{15} \chi_{c2} \gamma$	not seen
$\Gamma_{16} \chi_{c1} \pi^+ \pi^- \pi^0$	not seen
$\Gamma_{17} \chi_{c2} \pi^+ \pi^- \pi^0$	not seen
$\Gamma_{18} h_c(1P) \pi^+ \pi^-$	not seen
$\Gamma_{19} \phi \pi^+ \pi^-$	not seen
$\Gamma_{20} \phi f_0(980) \rightarrow \phi \pi^+ \pi^-$	not seen
$\Gamma_{21} D \bar{D}$	not seen
$\Gamma_{22} D^0 \bar{D}^0$	not seen
$\Gamma_{23} D^+ D^-$	not seen
$\Gamma_{24} D^* \bar{D} + c.c.$	not seen
$\Gamma_{25} D^*(2007)^0 \bar{D}^0 + c.c.$	not seen
$\Gamma_{26} D^*(2010)^+ D^- + c.c.$	not seen
$\Gamma_{27} D^* \bar{D}^*$	not seen
$\Gamma_{28} D^*(2007)^0 \bar{D}^*(2007)^0$	not seen
$\Gamma_{29} D^*(2010)^+ D^*(2010)^-$	not seen
$\Gamma_{30} D \bar{D} \pi + c.c.$	
$\Gamma_{31} D^0 D^- \pi^+ + c.c. \text{ (excl.)}$ $D^*(2007)^0 \bar{D}^{*0} + c.c.,$ $D^*(2010)^+ D^- + c.c.)$	not seen
$\Gamma_{32} D \bar{D}^* \pi + c.c. \text{ (excl. } D^* \bar{D}^*)$	not seen
$\Gamma_{33} D^0 D^* \pi^+ + c.c. \text{ (excl. } D^*(2010)^+ D^*(2010)^-)$	not seen
$\Gamma_{34} D^0 D^*(2010)^- \pi^+ + c.c.$	not seen
$\Gamma_{35} D^* \bar{D}^* \pi$	not seen
$\Gamma_{36} D_s^+ D_s^-$	not seen
$\Gamma_{37} D_s^* + D_s^- + c.c.$	not seen
$\Gamma_{38} D_s^* + D_s^-$	not seen
$\Gamma_{39} p \bar{p}$	not seen
$\Gamma_{40} K_S^0 K^\pm \pi^\mp$	not seen
$\Gamma_{41} K^+ K^- \pi^0$	not seen

X(4260) $\Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_2 \Gamma_1 / \Gamma$
9.0^{+1.0}_{-0.8} OUR AVERAGE					
$5.9^{+1.2}_{-0.9}$ eV OUR 2012 AVERAGE]					
$9.2 \pm 0.8 \pm 0.7$	7 LEES	12AC BABR	10.58 $e^+ e^- \rightarrow \gamma \pi^+ \pi^- J/\psi$		
$6.0 \pm 1.2^{+4.7}_{-0.5}$	8 YUAN	07 BELL	10.58 $e^+ e^- \rightarrow \gamma \pi^+ \pi^- J/\psi$		
$8.9^{+3.9}_{-3.1} \pm 1.8$	8.1 HE	06B CLEO	9.4–10.6 $e^+ e^- \rightarrow \gamma \pi^+ \pi^- J/\psi$		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$20.6 \pm 2.3^{+9.1}_{-1.7}$	9 YUAN	07 BELL	10.58 $e^+ e^- \rightarrow \gamma \pi^+ \pi^- J/\psi$	OCCUR=2	
$5.5 \pm 1.0^{+0.8}_{-0.7}$	125 ¹⁰ AUBERT,B	05I BABR	10.58 $e^+ e^- \rightarrow \gamma \pi^+ \pi^- J/\psi$		

NODE=M074230

NODE=M074G1
NODE=M074G1

NEW

OCCUR=2

7 From a single-resonance fit. Supersedes AUBERT,B 05!

8 Solution I of two equivalent solutions in a fit using two interfering resonances.

9 Solution II of two equivalent solutions in a fit using two interfering resonances.

10 From a single-resonance fit. Two interfering resonances are not excluded. Superseded by LEES 12AC.

$\Gamma(J/\psi K^+ K^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.2 90 11 YUAN 08 BELL $e^+ e^- \rightarrow \gamma K^+ K^- J/\psi$

11 From a fit of the broad $K^+ K^- J/\psi$ enhancement including a coherent $X(4260)$ amplitude with mass and width from YUAN 07.

$\Gamma(\psi(2S)\pi^+\pi^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.3 90 12 LIU 08H RVUE 10.58 $e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$
 $7.4^{+2.1}_{-1.7}$ 13 LIU 08H RVUE 10.58 $e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

12 For constructive interference with the $X(4360)$ in a combined fit of AUBERT 07s and WANG 07D data with three resonances.

13 For destructive interference with the $X(4360)$ in a combined fit of AUBERT 07s and WANG 07D data with three resonances.

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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<0.4 90 AUBERT,BE 06D BABR 10.6 $e^+ e^- \rightarrow K^+ K^- \pi^+ \pi^- \gamma$

$\Gamma(\phi f_0(980) \rightarrow \phi\pi^+\pi^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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<0.29 90 14 AUBERT 07AK BABR 10.6 $e^+ e^- \rightarrow \pi^+ \pi^- K^+ K^- \gamma$

14 AUBERT 07AK reports $[\Gamma(X(4260) \rightarrow \phi f_0(980) \rightarrow \phi\pi^+\pi^-) \times \Gamma(X(4260) \rightarrow e^+ e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+ K^-)] < 0.14$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+ K^-) = 48.9 \times 10^{-2}$.

$\Gamma(K_S^0 K^\pm \pi^\mp) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.5 90 AUBERT 08S BABR 10.6 $e^+ e^- \rightarrow K_S^0 K^\pm \pi^\mp \gamma$

$\Gamma(K^+ K^- \pi^0) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.6 90 AUBERT 08S BABR 10.6 $e^+ e^- \rightarrow K^+ K^- \pi^0 \gamma$

X(4260) BRANCHING RATIOS

$\Gamma(J/\psi f_0(980), f_0(980) \rightarrow \pi^+ \pi^-)/\Gamma(J/\psi \pi^+ \pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.17±0.13 15 LEES 12AC BABR 10.58 $e^+ e^- \rightarrow \gamma \pi^+ \pi^- J/\psi$

15 Systematic uncertainties not estimated.

$\Gamma(h_c(1P)\pi^+\pi^-)/\Gamma(J/\psi \pi^+\pi^-)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<1.0 90 16 PEDLAR 11 CLEO $e^+ e^- \rightarrow h_c(1P)\pi^+\pi^-$

16 At $\sqrt{s} = 4260$ MeV, PEDLAR 11 measures $\sigma(e^+ e^- \rightarrow h_c(1P)\pi^+\pi^-) = 32 \pm 17 \pm 6 \pm 6$ pb, where the errors are statistical, systematic, and due to uncertainty in $B(\psi(2S) \rightarrow \pi^0 h_c(1P))$, respectively.

$\Gamma(D\bar{D})/\Gamma(J/\psi \pi^+\pi^-)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<1.0 90 17 AUBERT 07BE BABR $e^+ e^- \rightarrow D\bar{D}\gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.0 90 CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D\bar{D}\gamma$

17 Using 4259 ± 10 MeV for the mass and 88 ± 24 MeV for the width of $X(4260)$.

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NODE=M074G3

NODE=M074G3;LINKAGE=YU

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OCCUR=2

NODE=M074G7;LINKAGE=LI

NODE=M074G7;LINKAGE=LU

NODE=M074G2

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NODE=M074R02

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NODE=M074R25

NODE=M074R25;LINKAGE=PE

NODE=M074R2

NODE=M074R2

NODE=M074R2;LINKAGE=AU

$\Gamma(D^0 \bar{D}^0)/\Gamma_{\text{total}}$ VALUE**not seen**

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen

not seen

DOCUMENT IDTECNCOMMENTCRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^0 \bar{D}^0$ AUBERT 09M BABR $e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$ PAKHLOVA 08 BELL $e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$ Γ_{22}/Γ

NODE=M074R12

NODE=M074R12

 $\Gamma(D^+ D^-)/\Gamma_{\text{total}}$ VALUE**not seen**CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^+ D^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^+ D^- \gamma$ not seen PAKHLOVA 08 BELL $e^+ e^- \rightarrow D^+ D^- \gamma$ Γ_{23}/Γ

NODE=M074R13

NODE=M074R13

 $\Gamma(D^* \bar{D} + \text{c.c.})/\Gamma(J/\psi \pi^+ \pi^-)$ VALUECL%DOCUMENT IDTECNCOMMENT<34 90 AUBERT 09M BABR $e^+ e^- \rightarrow \gamma D^* \bar{D}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<45 90 CRONIN-HEN..09 CLEO $e^+ e^-$ Γ_{24}/Γ_2

NODE=M074R03

NODE=M074R03

 $\Gamma(D^*(2007)^0 \bar{D}^0 + \text{c.c.})/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENTCRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*0} \bar{D}^0$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^{*0} \bar{D}^0 \gamma$ Γ_{25}/Γ

NODE=M074R14

NODE=M074R14

 $\Gamma(D^*(2010)^+ D^- + \text{c.c.})/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENTCRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*+} D^-$ PAKHLOVA 07 BELL $e^+ e^- \rightarrow D^{*+} D^- \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^{*+} D^- \gamma$ Γ_{26}/Γ

NODE=M074R15

NODE=M074R15

 $\Gamma(D^* \bar{D}^*)/\Gamma(J/\psi \pi^+ \pi^-)$ VALUECL%DOCUMENT IDTECNCOMMENT<11 90 CRONIN-HEN..09 CLEO $e^+ e^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<40 90 AUBERT 09M BABR $e^+ e^- \rightarrow \gamma D^* \bar{D}^*$ Γ_{27}/Γ_2

NODE=M074R04

NODE=M074R04

 $\Gamma(D^*(2007)^0 \bar{D}^*(2007)^0)/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENTCRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*0} \bar{D}^{*0}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^{*0} \bar{D}^{*0} \gamma$ Γ_{28}/Γ

NODE=M074R17

NODE=M074R17

 $\Gamma(D^*(2010)^+ D^*(2010)^-)/\Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENTCRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^{*+} D^{*-}$ PAKHLOVA 07 BELL $e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen AUBERT 09M BABR $e^+ e^- \rightarrow D^{*+} D^{*-} \gamma$ Γ_{29}/Γ

NODE=M074R18

NODE=M074R18

 $\Gamma(D^0 D^- \pi^+ + \text{c.c.} \text{ (excl. } D^*(2007)^0 \bar{D}^{*0} + \text{c.c., } D^*(2010)^+ D^- + \text{c.c.})) / \Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENTPAKHLOVA 08A BELL $10.6 e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$

NODE=M074R16

NODE=M074R16

 $\Gamma(D \bar{D}^* \pi + \text{c.c.} \text{ (excl. } D^* \bar{D}^*)) / \Gamma_{\text{total}}$ VALUEDOCUMENT IDTECNCOMMENTCRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D^* \bar{D} \pi$

NODE=M074R22

NODE=M074R22

 $\Gamma(D \bar{D}^* \pi + \text{c.c.} \text{ (excl. } D^* \bar{D}^*)) / \Gamma(J/\psi \pi^+ \pi^-)$ VALUECL%DOCUMENT IDTECNCOMMENT<15 90 CRONIN-HEN..09 CLEO $e^+ e^-$

NODE=M074R05

NODE=M074R05

$\Gamma(D^0 D^{*-} \pi^+ + \text{c.c. (excl. } D^*(2010)^+ D^*(2010)^-)) / \Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{33}/Γ
not seen	PAKHLOVA 09	BELL	$e^+ e^- \rightarrow D^0 D^{*-} \pi^+ \gamma$	

 $\Gamma(D^0 D^*(2010)^- \pi^+ + \text{c.c.}) / \Gamma(J/\psi \pi^+ \pi^-)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{34}/Γ_2
<9	90	PAKHLOVA 09	BELL	$e^+ e^- \rightarrow D^0 D^{*-} \pi^+$	

 $\Gamma(D^0 D^*(2010)^- \pi^+ + \text{c.c.}) / \Gamma_{\text{total}} \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	$\Gamma_{34}/\Gamma \times \Gamma_1/\Gamma$
$<0.42 \times 10^{-6}$	90	18 PAKHLOVA 09	BELL	$e^+ e^- \rightarrow D^0 D^{*-} \pi^+$	

18 Using 4263^{+8}_{-9} MeV for the mass of $X(4260)$.

 $\Gamma(D^* \bar{D}^* \pi) / \Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{35}/Γ
not seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^* \bar{D}^* \pi$	

 $\Gamma(D^* \bar{D}^* \pi) / \Gamma(J/\psi \pi^+ \pi^-)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{35}/Γ_2
<8.2	90	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D^* \bar{D}^* \pi$	

 $\Gamma(D_s^+ D_s^-) / \Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{36}/Γ
not seen	DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$	

not seen CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D_s^+ D_s^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen	PAKHLOVA 11	BELL	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
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 $\Gamma(D_s^+ D_s^-) / \Gamma(J/\psi \pi^+ \pi^-)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{36}/Γ_2
<0.7	95	DEL-AMO-SA..10N	BABR	$10.6 e^+ e^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.3	90	CRONIN-HEN..09	CLEO	$e^+ e^-$
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 $\Gamma(D_s^{*+} D_s^- + \text{c.c.}) / \Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{37}/Γ
not seen	DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$	

not seen CRONIN-HEN..09 CLEO $e^+ e^- \rightarrow D_s^{*+} D_s^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen	PAKHLOVA 11	BELL	$e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$
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 $\Gamma(D_s^{*+} D_s^- + \text{c.c.}) / \Gamma(J/\psi \pi^+ \pi^-)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{37}/Γ_2
< 0.8	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<44	95	DEL-AMO-SA..10N	BABR	$10.6 e^+ e^-$
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 $\Gamma(D_s^{*+} D_s^{*-}) / \Gamma_{\text{total}}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{38}/Γ
not seen	CRONIN-HEN..09	CLEO	$e^+ e^- \rightarrow D_s^{*+} D_s^{*-}$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen	PAKHLOVA 11	BELL	$e^+ e^- \rightarrow D_s^{*+} D_s^{*-} \gamma$
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not seen DEL-AMO-SA..10N BABR $e^+ e^- \rightarrow D_s^{*+} D_s^{*-} \gamma$

 $\Gamma(D_s^{*+} D_s^{*-}) / \Gamma(J/\psi \pi^+ \pi^-)$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{38}/Γ_2
< 9.5	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<30	95	DEL-AMO-SA..10N	BABR	$10.6 e^+ e^-$
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NODE=M074R23

NODE=M074R10

NODE=M074R10

NODE=M074R11

NODE=M074R11

NODE=M074R11;LINKAGE=PA

NODE=M074R24

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NODE=M074R08

NODE=M074R08

NODE=M074R21

NODE=M074R21

NODE=M074R09

NODE=M074R09

$\Gamma(p\bar{p})/\Gamma(J/\psi\pi^+\pi^-)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{39}/Γ_2
<0.13	90	19 AUBERT	06B	$e^+e^- \rightarrow p\bar{p}\gamma$	

19 Using 4259 ± 10 MeV for the mass and 88 ± 24 MeV for the width of $X(4260)$.

X(4260) REFERENCES

LEES	12AC	PR D86 051102	J.P. Lees <i>et al.</i>	(BABAR Collab.)
PAKHLOVA	11	PR D83 011101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PEDLAR	11	PRL 107 041803	T. Pedlar <i>et al.</i>	(CLEO Collab.)
DEL-AMO-SA...10N	PR D82 052004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	
AUBERT	09M	PR D79 092001	B. Aubert <i>et al.</i>	(BABAR Collab.)
CRONIN-HENRY...09	PR D80 072001	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)	
PAKHLOVA	09	PR D80 091101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
AUBERT	08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
LIU	08H	PR D78 014032	Z.Q. Liu, X.S. Qin, C.Z. Yuan	
PAKHLOVA	08	PR D77 011103	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA	08A	PR 100 062001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
YUAN	08	PR D77 011105	C.Z. Yuan <i>et al.</i>	(BELLE Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07BE	PR D76 111105	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07S	PRL 98 212001	B. Aubert <i>et al.</i>	(BABAR Collab.)
PAKHLOVA	07	PRL 98 092001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
WANG	07D	PRL 99 142002	X.L. Wang <i>et al.</i>	(BELLE Collab.)
YUAN	07	PRL 99 182004	C.Z. Yuan <i>et al.</i>	(BELLE Collab.)
AUBERT	06	PR D73 011101	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	06B	PR D73 012005	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,BE	06D	PR D74 091103	B. Aubert <i>et al.</i>	(BABAR Collab.)
COAN	06	PRL 96 162003	T.E. Coan <i>et al.</i>	(CLEO Collab.)
HE	06B	PR D74 091104	Q. He <i>et al.</i>	(CLEO Collab.)
AUBERT,B	05I	PRL 95 142001	B. Aubert <i>et al.</i>	(BABAR Collab.)

X(4350)

$I^G(J^{PC}) = 0^+(?^+)$

OMITTED FROM SUMMARY TABLE

Seen by SHEN 10 in the $\gamma\gamma \rightarrow J/\psi\phi$. Needs confirmation.

X(4350) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
4350.6$^{+4.6}_{-5.1}$$\pm 0.7$	$8.8^{+4.2}_{-3.2}$	¹ SHEN	10	BELL	$10.6 e^+e^- \rightarrow e^+e^- J/\psi\phi$

¹ Statistical significance of 3.2σ .

X(4350) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
13$^{+18}_{-9}$$\pm 4$	$8.8^{+4.2}_{-3.2}$	² SHEN	10	BELL	$10.6 e^+e^- \rightarrow e^+e^- J/\psi\phi$

² Statistical significance of 3.2σ .

X(4350) DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $J/\psi\phi$	seen
Γ_2 $\gamma\gamma$	seen

X(4350) $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(\gamma\gamma) \times \Gamma(J/\psi\phi)/\Gamma_{\text{total}}$		$\Gamma_2\Gamma_1/\Gamma$
6.7$^{+3.2}_{-2.4}$$\pm 1.1$	$8.8^{+4.2}_{-3.2}$	³ SHEN

• • • We do not use the following data for averages, fits, limits, etc. • • •

$1.5^{+0.7}_{-0.6}\pm 0.3$	$8.8^{+4.2}_{-3.2}$	⁴ SHEN	10	BELL	$10.6 e^+e^- \rightarrow e^+e^- J/\psi\phi$
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³ For $J^P = 0^+$. Statistical significance of 3.2σ .

⁴ For $J^P = 2^+$. Statistical significance of 3.2σ .

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NODE=M194M

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NODE=M194W

NODE=M194W

NODE=M194W;LINKAGE=SH

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DESIG=2

NODE=M194220

NODE=M194G01
NODE=M194G01

OCCUR=2

NODE=M194G01;LINKAGE=S0
NODE=M194G01;LINKAGE=S2

X(4350) BRANCHING RATIOS

$\Gamma(J/\psi\phi)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
seen	5 SHEN	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- J/\psi\phi$	

5 Statistical significance of 3.2σ .

$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
seen	6 SHEN	10 BELL	$10.6 e^+ e^- \rightarrow e^+ e^- J/\psi\phi$	

6 Statistical significance of 3.2σ .

X(4350) REFERENCES

SHEN	10	PRL 104 112004	C.P. Shen <i>et al.</i>	(BELLE Collab.)
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X(4360)

$$I^G(J^{PC}) = ?^?(1^{--})$$

Seen in radiative return from $e^+ e^-$ collisions at $\sqrt{s} = 9.54\text{--}10.58$ GeV by AUBERT 07S and WANG 07D. See also the review under the X(3872) particle listings. (See the index for the page number.)

X(4360) MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
4361 ± 9	1 WANG	07D BELL	$10.58 e^+ e^- \rightarrow \gamma\pi^+\pi^-\psi(2S)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$4355^{+9}_{-10} \pm 9$	2 LIU	08H RVUE	$10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$	
4324 ± 24	3 AUBERT	07S BABR	$10.58 e^+ e^- \rightarrow \gamma\pi^+\pi^-\psi(2S)$	

1 From a two-resonance fit.

2 From a combined fit of AUBERT 07S and WANG 07D data with two resonances.

3 From a single-resonance fit. Systematic errors not estimated.

X(4360) WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
74 $\pm 15 \pm 10$	4 WANG	07D BELL	$10.58 e^+ e^- \rightarrow \gamma\pi^+\pi^-\psi(2S)$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

$103^{+17}_{-15} \pm 11$	5 LIU	08H RVUE	$10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$	
172 ± 33	6 AUBERT	07S BABR	$10.58 e^+ e^- \rightarrow \gamma\pi^+\pi^-\psi(2S)$	

4 From a two-resonance fit.

5 From a combined fit of AUBERT 07S and WANG 07D data with two resonances.

6 From a single-resonance fit. Systematic errors not estimated.

X(4360) DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	
$\Gamma_2 \psi(2S)\pi^+\pi^-$	seen
$\Gamma_3 D^0 D^{*-} \pi^+$	

X(4360) $\Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\psi(2S)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT	$\Gamma_2\Gamma_1/\Gamma$
------------	-------------	------	---------	---------------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$11.1^{+1.3}_{-1.2}$	7 LIU	08H RVUE	$10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$	
12.3 ± 1.2	8 LIU	08H RVUE	$10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$	
$10.4 \pm 1.7 \pm 1.5$	9 WANG	07D BELL	$10.58 e^+ e^- \rightarrow \gamma\pi^+\pi^-\psi(2S)$	
$11.8 \pm 1.8 \pm 1.4$	10 WANG	07D BELL	$10.58 e^+ e^- \rightarrow \gamma\pi^+\pi^-\psi(2S)$	

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NODE=M194R01
NODE=M194R01

NODE=M194R01;LINKAGE=SH

NODE=M194R02
NODE=M194R02

NODE=M194R02;LINKAGE=SH

NODE=M194

REFID=53235

NODE=M181

NODE=M181

NODE=M181M

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NODE=M181M;LINKAGE=WA
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NODE=M181M;LINKAGE=AU

NODE=M181W

NODE=M181W

NODE=M181W;LINKAGE=WA
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NODE=M181W;LINKAGE=AU

NODE=M181215;NODE=M181

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DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=3

NODE=M181230

NODE=M181G1
NODE=M181G1

OCCUR=2

OCCUR=2

⁷ Solution I in a combined fit of AUBERT 07S and WANG 07D data with two resonances.⁸ Solution II in a combined fit of AUBERT 07S and WANG 07D data with two resonances.⁹ Solution I of two equivalent solutions in a fit using two interfering resonances.¹⁰ Solution II of two equivalent solutions in a fit using two interfering resonances.

X(4360) BRANCHING RATIOS

$$\Gamma(D^0 D^{*-} \pi^+)/\Gamma(\psi(2S) \pi^+ \pi^-) \quad \Gamma_3/\Gamma_2$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<8	90	PAKHLOVA 09	BELL	$e^+ e^- \rightarrow X(4360) \rightarrow D^0 D^{*-} \pi^+$

$$\Gamma(D^0 D^{*-} \pi^+)/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}} \quad \Gamma_3/\Gamma \times \Gamma_1/\Gamma$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<0.72 \times 10^{-6}$	90	11 PAKHLOVA 09	BELL	$e^+ e^- \rightarrow X(4360) \rightarrow D^0 D^{*-} \pi^+$

11 Using $4355^{+9}_{-10} \pm 9$ MeV for the mass of $X(4360)$.

X(4360) REFERENCES

PAKHLOVA 09	PR D80 091101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
LIU 08H	PR D78 014032	Z.Q. Liu, X.S. Qin, C.Z. Yuan	
AUBERT 07S	PRL 98 212001	B. Aubert <i>et al.</i>	(BABAR Collab.)
WANG 07D	PRL 99 142002	X.L. Wang <i>et al.</i>	(BELLE Collab.)

$\psi(4415)$

$$I^G(J^{PC}) = 0^-(1^{--})$$

$\psi(4415)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

4421 ± 4 OUR ESTIMATE

4415.1 ± 7.9 ¹ ABLIKIM 08D BES2 $e^+ e^- \rightarrow$ hadrons

• • • We do not use the following data for averages, fits, limits, etc. • • •

4412 ± 15	² MO	10 RVUE	$e^+ e^- \rightarrow$ hadrons
4411 ± 7	³ PAKHLOVA	08A BELL	$10.6 e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$
4425 ± 6	⁴ SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
4429 ± 9	⁵ SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
4417 ± 10	BRANDELIK	78C DASP	$e^+ e^-$
4414 ± 7	SIEGRIST	76 MRK1	$e^+ e^-$

¹ Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (234 \pm 88)^\circ$.

² Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.

³ Systematic uncertainties not estimated.

⁴ From a fit to Crystal Ball (OSTERHELD 86) data.

⁵ From a fit to BES (BAI 02C) data.

$\psi(4415)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

62 ± 20 OUR ESTIMATE

71.5 ± 19.0 ⁶ ABLIKIM 08D BES2 $e^+ e^- \rightarrow$ hadrons

• • • We do not use the following data for averages, fits, limits, etc. • • •

118 ± 32	⁷ MO	10 RVUE	$e^+ e^- \rightarrow$ hadrons
77 ± 20	⁸ PAKHLOVA	08A BELL	$10.6 e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$
119 ± 16	⁹ SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
118 ± 35	¹⁰ SETH	05A RVUE	$e^+ e^- \rightarrow$ hadrons
66 ± 15	BRANDELIK	78C DASP	$e^+ e^-$
33 ± 10	SIEGRIST	76 MRK1	$e^+ e^-$

NODE=M181G1;LINKAGE=LI

NODE=M181G1;LINKAGE=LU

NODE=M181G1;LINKAGE=WA

NODE=M181G1;LINKAGE=WN

NODE=M181225

NODE=M181R01

NODE=M181R01

NODE=M181R02

NODE=M181R02

NODE=M181R02;LINKAGE=PA

NODE=M181

REFID=53143

REFID=52296

REFID=51724

REFID=51959

NODE=M073

NODE=M073M

NODE=M073M

→ UNCHECKED ←

OCCUR=2

NODE=M073M;LINKAGE=AB

NODE=M073M;LINKAGE=MO

NODE=M073M;LINKAGE=NS

NODE=M073M;LINKAGE=ST

NODE=M073M;LINKAGE=SE

NODE=M073W

NODE=M073W

→ UNCHECKED ←

OCCUR=2

- 6 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (234 \pm 88)^\circ$.
- 7 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects.
- 8 Systematic uncertainties not estimated.
- 9 From a fit to Crystal Ball (OSTERHELD 86) data.
- 10 From a fit to BES (BAI 02C) data.

$\psi(4415)$ DECAY MODES

Due to the complexity of the $c\bar{c}$ threshold region, in this listing, “seen” (“not seen”) means that a cross section for the mode in question has been measured at effective \sqrt{s} near this particle’s central mass value, more (less) than 2σ above zero, without regard to any peaking behavior in \sqrt{s} or absence thereof. See mode listing(s) for details and references.

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 D\bar{D}$	not seen	
$\Gamma_2 D^0\bar{D}^0$	seen	
$\Gamma_3 D^+D^-$	seen	
$\Gamma_4 D^*\bar{D} + \text{c.c.}$	not seen	
$\Gamma_5 D^*(2007)^0\bar{D}^0 + \text{c.c.}$	seen	
$\Gamma_6 D^*(2010)^+D^- + \text{c.c.}$	seen	
$\Gamma_7 D^*\bar{D}^*$	not seen	
$\Gamma_8 D^*(2007)^0\bar{D}^*(2007)^0 + \text{c.c.}$	seen	
$\Gamma_9 D^*(2010)^+D^*(2010)^- + \text{c.c.}$	seen	
$\Gamma_{10} D^0 D^- \pi^+ (\text{excl. } D^*(2007)^0\bar{D}^0 + \text{c.c.}, D^*(2010)^+D^- + \text{c.c.})$	< 2.3 %	90%
$\Gamma_{11} D\bar{D}_2^*(2460) \rightarrow D^0 D^- \pi^+ + \text{c.c.}$	(10 ± 4) %	
$\Gamma_{12} D^0 D^* \pi^+ + \text{c.c.}$	< 11 %	90%
$\Gamma_{13} D_s^+ D_s^-$	not seen	
$\Gamma_{14} D_s^{*+} D_s^{-} + \text{c.c.}$	seen	
$\Gamma_{15} D_s^{*+} D_s^{*-}$	not seen	
$\Gamma_{16} e^+ e^-$	(9.4 ± 3.2) $\times 10^{-6}$	

$\psi(4415)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$	Γ_{16}
VALUE (keV)	
0.58 \pm 0.07 OUR ESTIMATE	
0.35 \pm 0.12	
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.4 to 0.8	11 ABLIKIM 08D BES2 $e^+e^- \rightarrow$ hadrons
0.72 \pm 0.11	12 MO 10 RVUE $e^+e^- \rightarrow$ hadrons
0.64 \pm 0.23	13 SETH 05A RVUE $e^+e^- \rightarrow$ hadrons
0.49 \pm 0.13	14 SETH 05A RVUE $e^+e^- \rightarrow$ hadrons
0.44 \pm 0.14	BRANDELIK 78C DASP e^+e^-
	SIEGRIST 76 MRK1 e^+e^-

11 Reanalysis of data presented in BAI 02C. From a global fit over the center-of-mass energy region 3.7–5.0 GeV covering the $\psi(3770)$, $\psi(4040)$, $\psi(4160)$, and $\psi(4415)$ resonances. Phase angle fixed in the fit to $\delta = (234 \pm 88)^\circ$.

12 Reanalysis of data presented in BAI 00 and BAI 02C. From a global fit over the center-of-mass energy 3.8–4.8 GeV covering the $\psi(4040)$, $\psi(4160)$ and $\psi(4415)$ resonances and including interference effects. Four sets of solutions are obtained with the same fit quality, mass and total width, but with different e^+e^- partial widths. We quote only the range of values.

13 From a fit to Crystal Ball (OSTERHELD 86) data.

14 From a fit to BES (BAI 02C) data.

$\psi(4415)$ BRANCHING RATIOS

NODE=M073W;LINKAGE=AB

NODE=M073W;LINKAGE=MO

NODE=M073W;LINKAGE=NS

NODE=M073W;LINKAGE=ST

NODE=M073W;LINKAGE=SE

NODE=M073215;NODE=M073

NODE=M073

DESIG=7;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=8

DESIG=9

DESIG=10;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=11

DESIG=12

DESIG=13;OUR EVAL; \rightarrow UNCHECKED \leftarrow

DESIG=14

DESIG=15

DESIG=4

DESIG=5

DESIG=6

DESIG=16

DESIG=17

DESIG=18

DESIG=1

NODE=M073220

NODE=M073W1

NODE=M073W1

\rightarrow UNCHECKED \leftarrow

OCCUR=2

NODE=M073W1;LINKAGE=AB

NODE=M073W1;LINKAGE=MO

NODE=M073W1;LINKAGE=ST

NODE=M073W1;LINKAGE=SE

NODE=M073225

$\Gamma(D^0\bar{D}^0)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

seen

PAKHLOVA	08	BELL	$e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$
----------	----	------	--

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen

AUBERT	09M	BABR	$e^+ e^- \rightarrow D^0 \bar{D}^0 \gamma$
--------	-----	------	--

 Γ_2/Γ NODE=M073R04
NODE=M073R04 $\Gamma(D^+ D^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

seen

PAKHLOVA	08	BELL	$e^+ e^- \rightarrow D^+ D^- \gamma$
----------	----	------	--------------------------------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

not seen

AUBERT	09M	BABR	$e^+ e^- \rightarrow D^+ D^- \gamma$
--------	-----	------	--------------------------------------

 Γ_3/Γ NODE=M073R05
NODE=M073R05 $\Gamma(D\bar{D})/\Gamma(D^*\bar{D}^*)$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

0.14±0.12±0.03

AUBERT	09M	BABR	$e^+ e^- \rightarrow \gamma D^{(*)}\bar{D}^{(*)}$
--------	-----	------	---

 Γ_1/Γ NODE=M073R02
NODE=M073R02 $\Gamma(D^*(2007)^0\bar{D}^0 + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

seen

AUBERT	09M	BABR	$e^+ e^- \rightarrow D^{*0}\bar{D}^0 \gamma$
--------	-----	------	--

 $\Gamma(D^*(2010)^+ D^- + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

0.17±0.25±0.03

AUBERT	09M	BABR	$e^+ e^- \rightarrow \gamma D^{(*)}\bar{D}^{(*)}$
--------	-----	------	---

 Γ_5/Γ NODE=M073R06
NODE=M073R06 $\Gamma(D^*\bar{D} + \text{c.c.})/\Gamma(D^*\bar{D}^*)$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

0.17±0.25±0.03

AUBERT	09M	BABR	$e^+ e^- \rightarrow \gamma D^{(*)}\bar{D}^{(*)}$
--------	-----	------	---

 Γ_4/Γ NODE=M073R03
NODE=M073R03 $\Gamma(D^*(2007)^0\bar{D}^*(2007)^0 + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

seen

AUBERT	09M	BABR	$e^+ e^- \rightarrow D^{*0}\bar{D}^{*0} \gamma$
--------	-----	------	---

seen

PAKHLOVA	07	BELL	$e^+ e^- \rightarrow D^{*+}\bar{D}^{-} \gamma$
----------	----	------	--

 Γ_9/Γ NODE=M073R09
NODE=M073R09 $\Gamma(D\bar{D}_2^*(2460) \rightarrow D^0 D^- \pi^+ + \text{c.c.})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
--------------------------	-------------	------	---------

10.5±2.4±3.8

15	PAKHLOVA	08A	BELL	$10.6 e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$
----	----------	-----	------	---

15 Using 4421 ± 4 MeV for the mass and 62 ± 20 MeV for the width of $\psi(4415)$. Γ_{11}/Γ NODE=M073R3
NODE=M073R3 $\Gamma(D^0 D^- \pi^+ (\text{excl. } D^*(2007)^0\bar{D}^0 + \text{c.c.}, D^*(2010)^+ D^- + \text{c.c.}) /$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
-------	-----	-------------	------	---------

<0.22

90

16	PAKHLOVA	08A	BELL	$10.6 e^+ e^- \rightarrow D^0 D^- \pi^+ \gamma$
----	----------	-----	------	---

16 Using 4421 ± 4 MeV for the mass and 62 ± 20 MeV for the width of $\psi(4415)$. Γ_{10}/Γ_{11}

NODE=M073R4

 $\Gamma(D^0 D^{*-} \pi^+ + \text{c.c.})/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
-------	-----	-------------	------	---------

<0.99 × 10⁻⁶

90

17	PAKHLOVA	09	BELL	$e^+ e^- \rightarrow D^0 D^{*-} \pi^+$
----	----------	----	------	--

17 Using 4421 ± 4 MeV for the mass of $\psi(4415)$. $\Gamma_{12}/\Gamma \times \Gamma_{16}/\Gamma$

NODE=M073R01

NODE=M073R01

 $\Gamma(D_s^+ D_s^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
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not seen

PAKHLOVA	11	BELL	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
----------	----	------	--

not seen

DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^+ D_s^- \gamma$
-----------------	------	--

 Γ_{13}/Γ

NODE=M073R10

NODE=M073R10

 $\Gamma(D_s^{*+} D_s^- + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
-------	-------------	------	---------

seen

PAKHLOVA	11	BELL	$e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$
----------	----	------	---

seen

DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^{*+} D_s^- \gamma$
-----------------	------	---

NODE=M073R11

NODE=M073R11

$\Gamma(D_s^{*+} D_s^{*-})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_{15}/Γ
not seen	PAKHLOVA 11	BELL	$e^+ e^- \rightarrow D_s^{*+} D_s^{*-} \gamma$	
not seen	DEL-AMO-SA..10N	BABR	$e^+ e^- \rightarrow D_s^{*+} D_s^{*-} \gamma$	

 $\psi(4415)$ REFERENCES

PAKHLOVA 11	PR D83 011101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
DEL-AMO-SA..10N	PR D82 052004	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
MO 10	PR D82 077501	X.H. Mo, C.Z. Yuan, P. Wang	(BHEP)
AUBERT 09M	PR D79 092001	B. Aubert <i>et al.</i>	(BABAR Collab.)
PAKHLOVA 09	PR D80 091101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
ABLIKIM 08D	PL B660 315	M. Ablikim <i>et al.</i>	(BES Collab.)
PAKHLOVA 08	PR D77 011103	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA 08A	PRL 100 062001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
PAKHLOVA 07	PR D98 092001	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
SETH 05A	PR D72 017501	K.K. Seth	
BAI 02C	PRL 88 101802	J.Z. Bai <i>et al.</i>	(BES Collab.)
BAI 00	PRL 84 594	J.Z. Bai <i>et al.</i>	(BES Collab.)
OSTERHELD 86	SLAC-PUB-4160	A. Osterheld <i>et al.</i>	(SLAC Crystal Ball Collab.)
BRANDELIK 78C	PL 76B 361	R. Brandelik <i>et al.</i>	(DASP Collab.)
SIEGRIST 76	PRL 36 700	J.L. Siegrist <i>et al.</i>	(LBL, SLAC)

 $X(4430)^{\pm}$

$I(J^P) = ?(?)$

OMITTED FROM SUMMARY TABLE

Seen by CHOI 08 in $B \rightarrow K\pi^+\psi(2S)$ decays and confirmed by reanalysis of the same data sample in MIZUK 09. Not seen by AUBERT 09AA.

 $X(4430)^{\pm}$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
4443$^{+15+19}_{-12-13}$	¹ MIZUK 09	BELL	$B \rightarrow K\pi^+\psi(2S)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				

4433 $\pm 4 \pm 2$ ² CHOI 08 BELL $B \rightarrow K\pi^+\psi(2S)$

¹ From a Dalitz plot analysis.

² Superseded by MIZUK 09.

 $X(4430)^{\pm}$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
107$^{+86+74}_{-43-56}$	³ MIZUK 09	BELL	$B \rightarrow K\pi^+\psi(2S)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				

45 $\pm 18 \pm 30$ ⁴ CHOI 08 BELL $B \rightarrow K\pi^+\psi(2S)$

³ From a Dalitz plot analysis.

⁴ Superseded by MIZUK 09.

 $X(4430)^{\pm}$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \pi^+\psi(2S)$	seen
$\Gamma_2 \pi^+ J/\psi$	not seen

 $X(4430)^{\pm}$ BRANCHING RATIOS

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
seen	⁵ MIZUK 09	BELL	$B \rightarrow K\pi^+\psi(2S)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				

not seen ⁶ AUBERT 09AA BABR $B \rightarrow K\pi^+\psi(2S)$

⁵ Measured a product of branching fractions $B(\bar{B}^0 \rightarrow K^- X(4430)^+) \times B(X(4430)^+ \rightarrow \pi^+\psi(2S)) = (3.2^{+1.8+5.3}_{-0.9-1.6}) \times 10^{-5}$.

⁶ AUBERT 09AA quotes $B(B^+ \rightarrow \bar{K}^0 X(4430)^+) \times B(X(4430)^+ \rightarrow \pi^+\psi(2S)) < 4.7 \times 10^{-5}$ and $B(\bar{B}^0 \rightarrow K^- X(4430)^+) \times B(X(4430)^+ \rightarrow \pi^+\psi(2S)) < 3.1 \times 10^{-5}$ at 95% CL.

NODE=M073R12
NODE=M073R12

NODE=M073

REFID=53638
REFID=53532
REFID=53540
REFID=52724
REFID=53143
REFID=52142
REFID=52132
REFID=52134
REFID=51628
REFID=50813
REFID=50506
REFID=50503
REFID=51064
REFID=22232
REFID=22243

NODE=M195

NODE=M195

NODE=M195M

NODE=M195M

NODE=M195M;LINKAGE=MI
NODE=M195M;LINKAGE=CH

NODE=M195W

NODE=M195W

NODE=M195W;LINKAGE=MI
NODE=M195W;LINKAGE=CH

NODE=M195215;NODE=M195

DESIG=1

DESIG=2

NODE=M195225

NODE=M195R01
NODE=M195R01

NODE=M195R01;LINKAGE=MI

NODE=M195R01;LINKAGE=AU

$\Gamma(\pi^+ J/\psi)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
not seen	7 AUBERT	09AA BABR	$B \rightarrow K\pi^+ J/\psi$	
7 AUBERT 09AA quotes $B(B^+ \rightarrow \bar{K}^0 X(4430)^+) \times B(X(4430)^+ \rightarrow \pi^+ J/\psi) < 1.5 \times 10^{-5}$ and $B(\bar{B}^0 \rightarrow K^- X(4430)^+) \times B(X(4430)^+ \rightarrow \pi^+ J/\psi) < 0.4 \times 10^{-5}$ at 95% CL.				

 $X(4430)^{\pm}$ REFERENCES

AUBERT	09AA PR D79 112001	B. Aubert <i>et al.</i>	(BABAR Collab.)
MIZUK	09 PR D80 031104	R. Mizuk <i>et al.</i>	(BELLE Collab.)
CHOI	08 PRL 100 142001	S.-K. Choi <i>et al.</i>	(BELLE Collab.)

 $X(4660)$

$$I^G(J^{PC}) = ?^?(1^{--})$$

Seen in radiative return from $e^+ e^-$ collisions at $\sqrt{s} = 9.54\text{--}10.58$ GeV by WANG 07D. Also obtained in a combined fit of WANG 07D and AUBERT 07S. See also the review under the $X(3872)$ particle listings. (See the index for the page number.)

 $X(4660)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
4664±11±5	WANG 07D	BELL	$10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				

$4661^{+9}_{-8} \pm 6$ ¹ LIU 08H RVUE $10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

¹ From a combined fit of AUBERT 07S and WANG 07D data with two resonances.

 $X(4660)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
48±15±3	WANG 07D	BELL	$10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				

$42^{+17}_{-12} \pm 6$ ² LIU 08H RVUE $10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

² From a combined fit of AUBERT 07S and WANG 07D data with two resonances.

 $X(4660)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	
$\Gamma_1 e^+ e^-$		
$\Gamma_2 \psi(2S)\pi^+\pi^-$	seen	
$\Gamma_3 D^0 D^{*-}\pi^+$		

 $X(4660) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

VALUE (eV)	DOCUMENT ID	TECN	COMMENT	$\Gamma_2\Gamma_1/\Gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

$2.2^{+0.7}_{-0.6}$ ³ LIU 08H RVUE $10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

5.9 ± 1.6 ⁴ LIU 08H RVUE $10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

$3.0 \pm 0.9 \pm 0.3$ ⁵ WANG 07D BELL $10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

$7.6 \pm 1.8 \pm 0.8$ ⁶ WANG 07D BELL $10.58 e^+ e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

³ Solution I in a combined fit of AUBERT 07S and WANG 07D data with two resonances.

⁴ Solution II in a combined fit of AUBERT 07S and WANG 07D data with two resonances.

⁵ Solution I of two equivalent solutions in a fit using two interfering resonances.

⁶ Solution II of two equivalent solutions in a fit using two interfering resonances.

NODE=M195R02
NODE=M195R02

NODE=M195R02;LINKAGE=AU

NODE=M195

REFID=52940
REFID=52960
REFID=52178

NODE=M189

NODE=M189

NODE=M189M

NODE=M189M

NODE=M189M;LINKAGE=LI

NODE=M189W

NODE=M189W

NODE=M189W;LINKAGE=LI

NODE=M189215;NODE=M189

DESIG=1

DESIG=2;OUR EVAL;→ UNCHECKED ←
DESIG=3

NODE=M189230

NODE=M189G1
NODE=M189G1

OCCUR=2

OCCUR=2

NODE=M189G1;LINKAGE=LI
NODE=M189G1;LINKAGE=LU
NODE=M189G1;LINKAGE=WA
NODE=M189G1;LINKAGE=WN

X(4660) BRANCHING RATIOS

$\Gamma(D^0 D^{*-} \pi^+)/\Gamma(\psi(2S) \pi^+ \pi^-)$	Γ_3/Γ_2			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<10	90	PAKHLOVA 09	BELL	$e^+ e^- \rightarrow X(4660) \rightarrow D^0 D^{*-} \pi^+$

$\Gamma(D^0 D^{*-} \pi^+)/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$	$\Gamma_3/\Gamma \times \Gamma_1/\Gamma$			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<0.37 \times 10^{-6}$	90	7 PAKHLOVA 09	BELL	$e^+ e^- \rightarrow X(4660) \rightarrow D^0 D^{*-} \pi^+$

⁷ Using $4664 \pm 11 \pm 5$ MeV for the mass of $X(4660)$.

X(4660) REFERENCES

PAKHLOVA 09	PR D80 091101	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
LIU 08H	PR D78 014032	Z.Q. Liu, X.S. Qin, C.Z. Yuan	
AUBERT 07S	PRL 98 212001	B. Aubert <i>et al.</i>	(BABAR Collab.)
WANG 07D	PRL 99 142002	X.L. Wang <i>et al.</i>	(BELLE Collab.)

b̄b MESONS

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$\eta_b(1S)$

$$\mathcal{I}^G(J^{PC}) = 0^+(0^-+)$$

OMMITTED FROM SUMMARY TABLE

Quantum numbers shown are quark-model predictions. Observed in radiative decay of the $\Upsilon(3S)$, therefore $C = +$.

$\eta_b(1S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
9398.0 ± 3.2 OUR AVERAGE	Error includes scale factor of 1.8. See the ideogram below. [9391.0 ± 2.8 MeV OUR 2012 AVERAGE]			
9402.4 ± 1.5 ± 1.8	34k	1 MIZUK	12 BELL	$e^+ e^- \rightarrow \gamma \pi^+ \pi^-$ + hadrons
9391.8 ± 6.6 ± 2.0	$2.3 \pm 0.5k$	2 BONVICINI	10 CLEO	$\Upsilon(3S) \rightarrow \gamma X$
$9394.2^{+4.8}_{-4.9} \pm 2.0$	$13 \pm 5k$	2 AUBERT	09AQ BABR	$\Upsilon(2S) \rightarrow \gamma X$
$9388.9^{+3.1}_{-2.3} \pm 2.7$	$19 \pm 3k$	2 AUBERT	08V BABR	$\Upsilon(3S) \rightarrow \gamma X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

9393.2 ± 3.4 ± 2.3	10^{+5}_{-4}	2,3 DOBBS	12	$\Upsilon(2S) \rightarrow \gamma$ hadrons
$9300 \pm 20 \pm 20$		HEISTER	02D ALEP	$181-209 e^+ e^-$

¹ With floating width. Not independent of the corresponding mass difference measurement.

² Assuming $\eta_b(1S) = 10$ MeV. Not independent of the corresponding γ energy or mass difference measurements.

³ Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

NODE=M189225

NODE=M189R01

NODE=M189R01

NODE=M189R02

NODE=M189R02

NODE=M189R02;LINKAGE=PA

NODE=M189

REFID=53143

REFID=52296

REFID=51724

REFID=51959

NODE=MXXX030

NODE=M849

NODE=M849

NODE=M171

NODE=M171

NODE=M171M

NODE=M171M

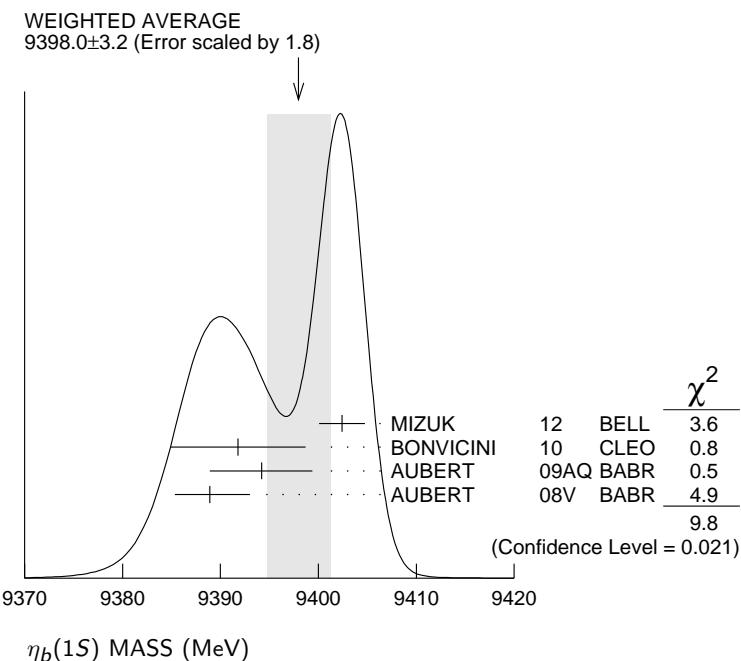
NEW

NODE=M171M

NODE=M171M;LINKAGE=MI

NODE=M171M;LINKAGE=AU

NODE=M171M;LINKAGE=DO

 $m\gamma(1S) - m_{\eta_b}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT	
62.3\pm3.2 OUR AVERAGE	Error includes scale factor of 1.8. See the ideogram below. [69.3 \pm 2.8 MeV OUR 2012 AVERAGE]				NODE=M171M2
57.9 \pm 1.5 \pm 1.8	34k	⁴ MIZUK	12	BELL $e^+ e^- \rightarrow \gamma \pi^+ \pi^-$ + hadrons	
68.5 \pm 6.6 \pm 2.0	2.3 \pm 0.5k	⁵ BONVICINI	10	CLEO $\gamma(3S) \rightarrow \gamma X$	
66.1 $^{+4.8}_{-4.9}$ \pm 2.0	13 \pm 5k	⁵ AUBERT	09AQ BABR	$\gamma(2S) \rightarrow \gamma X$	
71.4 $^{+2.3}_{-3.1}$ \pm 2.7	19 \pm 3k	⁵ AUBERT	08V BABR	$\gamma(3S) \rightarrow \gamma X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
67.1 \pm 3.4 \pm 2.3	10 $^{+5}_{-4}$	5,6 DOBBS	12	$\gamma(2S) \rightarrow \gamma$ hadrons	

⁴ With floating width. Not independent of the corresponding mass measurement.⁵ Assuming $\Gamma_{\eta_b(1S)} = 10$ MeV. Not independent of the corresponding γ energy or mass measurements.

6 Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

NODE=M171M2

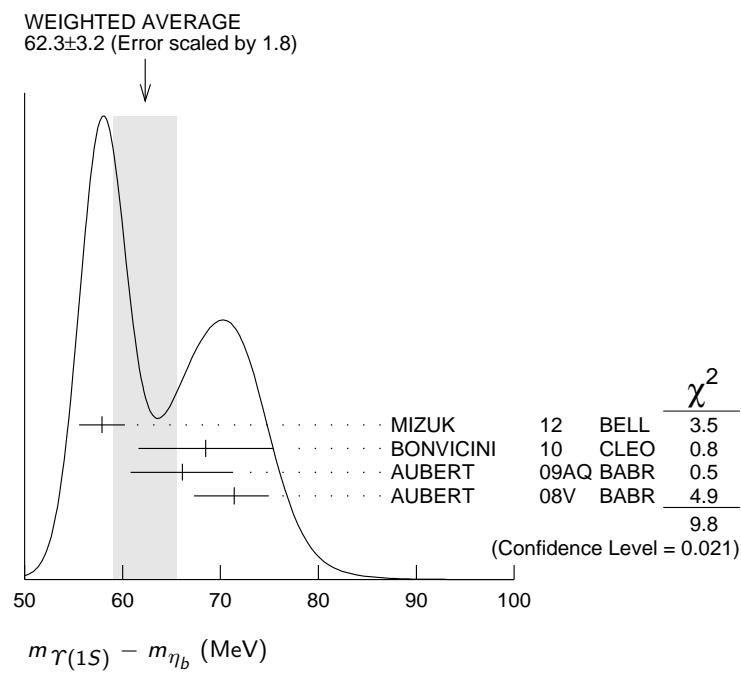
NODE=M171M2

NEW

NODE=M171M2;LINKAGE=MI

NODE=M171M2;LINKAGE=AU

NODE=M171M2;LINKAGE=DO



γ ENERGY IN $\Upsilon(3S)$ DECAY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
920.6^{+2.8}_{-3.2} OUR AVERAGE				
918.6 \pm 6.0 \pm 1.9	2.3 \pm 0.5k	7 BONVICINI	10 CLEO	$\Upsilon(3S) \rightarrow \gamma X$
921.2 ^{+2.1} _{-2.8} \pm 2.4	19 \pm 3k	7 AUBERT	08V BABR	$\Upsilon(3S) \rightarrow \gamma X$
⁷ Assuming $\Gamma_{\eta_b}(1S) = 10$ MeV. Not independent of the corresponding mass or mass difference measurements.				

NODE=M171DM

NODE=M171DM

γ ENERGY IN $\Upsilon(2S)$ DECAY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
609.3^{+4.6}_{-4.5}\pm1.9				
13 \pm 5k	8 AUBERT	09AQ BABR		$\Upsilon(2S) \rightarrow \gamma X$
⁸ Assuming $\Gamma_{\eta_b}(1S) = 10$ MeV. Not independent of the corresponding mass or mass difference measurements.				

NODE=M171DM;LINKAGE=BO

NODE=M171U2S

NODE=M171U2S

NODE=M171U2S;LINKAGE=AU

$\eta_b(1S)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
10.8 ^{+4.0} _{-3.7} ^{+4.5} _{-2.0}	34k	9 MIZUK	12 BELL	$e^+ e^- \rightarrow \gamma \pi^+ \pi^- + \text{hadrons}$

With floating mass.

NODE=M171W

NODE=M171W

NODE=M171W;LINKAGE=MI

NODE=M171225;NODE=M171

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 hadrons	seen	
Γ_2 $3h^+ 3h^-$	not seen	
Γ_3 $2h^+ 2h^-$	not seen	
Γ_4 $4h^+ 4h^-$		
Γ_5 $\gamma\gamma$	not seen	
Γ_6 $\mu^+ \mu^-$	$< 9 \times 10^{-3}$	90%
Γ_7 $\tau^+ \tau^-$	$< 8 \%$	90%

DESIG=7

DESIG=1;OUR EST; \rightarrow UNCHECKED \leftarrow DESIG=2;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=4

DESIG=3;OUR EST; \rightarrow UNCHECKED \leftarrow

DESIG=5

DESIG=6

$\eta_b(1S)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	$\Gamma_2\Gamma_5/\Gamma$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<470	95	ABDALLAH	06 DLPH	161–209 $e^+ e^-$	
<132	95	HEISTER	02D ALEP	181–209 $e^+ e^-$	

NODE=M171230

NODE=M171G1

NODE=M171G1

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	$\Gamma_3\Gamma_5/\Gamma$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<190	95	ABDALLAH	06 DLPH	161–209 $e^+ e^-$	
< 48	95	HEISTER	02D ALEP	181–209 $e^+ e^-$	

NODE=M171G2

NODE=M171G2

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	$\Gamma_4\Gamma_5/\Gamma$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<660	95	ABDALLAH	06 DLPH	161–209 $e^+ e^-$	

NODE=M171G3

NODE=M171G3

$\eta_b(1S)$ BRANCHING RATIOS

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
seen					
34k		MIZUK	12 BELL	$e^+ e^- \rightarrow \gamma \pi^+ \pi^- + \text{hadrons}$	

NODE=M171235

NODE=M171R03

NODE=M171R03

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<9 \times 10^{-3}$	90	10 AUBERT	09Z BABR	$e^+e^- \rightarrow \gamma(2S,3S) \rightarrow \gamma\eta_b$ 10 Obtained using $B(\gamma(2S) \rightarrow \gamma\eta_b) = (4.2^{+1.1}_{-1.0} \pm 0.9) \times 10^{-4}$ and $B(\gamma(3S) \rightarrow \gamma\eta_b) = (4.8 \pm 0.5 \pm 0.6) \times 10^{-4}$. This limit is equivalent to $B(\eta_b \rightarrow \mu^+\mu^-) = (-0.25 \pm 0.51 \pm 0.33)\%$ measurement.	

$\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<8 \times 10^{-2}$	90	AUBERT	09P BABR	$e^+e^- \rightarrow \gamma\tau^+\tau^-$	

$\eta_b(1S)$ REFERENCES

DOBBS 12	PRL 109 082001	S. Dobbs <i>et al.</i>	(BELLE Collab.)
MIZUK 12	PRL 109 232002	R. Mizuk <i>et al.</i>	(CLEO Collab.)
BONVICINI 10	PR D81 031104	G. Bonvicini <i>et al.</i>	(BABAR Collab.)
AUBERT 09AQ	PR D81 031104	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 09P	PRL 103 181801	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 09Z	PRL 103 081803	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 08V	PRL 101 071801	B. Aubert <i>et al.</i>	(BABAR Collab.)
ABDALLAH 06	PL B634 340	J.M. Abdallah <i>et al.</i>	(DELPHI Collab.)
HEISTER 02D	PL B530 56	A. Heister <i>et al.</i>	(ALEPH Collab.)

$\gamma(1S)$

$$\Gamma^G(JPC) = 0^-(1^- -)$$

$\gamma(1S)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
9460.30 ± 0.26 OUR AVERAGE			
9460.51 ± 0.09 ± 0.05	1 ARTAMONOV 00	MD1	$e^+e^- \rightarrow \text{hadrons}$
9459.97 ± 0.11 ± 0.07	MACKAY 84	REDE	$e^+e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
9460.60 ± 0.09 ± 0.05	2,3 BARU	92B	REDE $e^+e^- \rightarrow \text{hadrons}$
9460.59 ± 0.12	BARU	86	REDE $e^+e^- \rightarrow \text{hadrons}$
9460.6 ± 0.4	3,4 ARTAMONOV 84	REDE	$e^+e^- \rightarrow \text{hadrons}$
1 Reanalysis of BARU 92B and ARTAMONOV 84 using new electron mass (COHEN 87). 2 Superseding BARU 86. 3 Superseded by ARTAMONOV 00. 4 Value includes data of ARTAMONOV 82.			

$\gamma(1S)$ WIDTH

VALUE (keV)	DOCUMENT ID
54.02 ± 1.25 OUR EVALUATION	
See the Note on "Width Determinations of the γ States"	

$\gamma(1S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 \tau^+\tau^-$	(2.60 ± 0.10) %	
$\Gamma_2 e^+e^-$	(2.38 ± 0.11) %	
$\Gamma_3 \mu^+\mu^-$	(2.48 ± 0.05) %	
Hadronic decays		
$\Gamma_4 gg\bar{g}$	(81.7 ± 0.7) %	
$\Gamma_5 \gamma g\bar{g}$	(2.2 ± 0.6) %	
$\Gamma_6 \eta'(958)$ anything	(2.94 ± 0.24) %	
$\Gamma_7 J/\psi(1S)$ anything	(6.5 ± 0.7) × 10 ⁻⁴	
$\Gamma_8 \chi_{c0}$ anything	< 5 × 10 ⁻³	90%
$\Gamma_9 \chi_{c1}$ anything	(2.3 ± 0.7) × 10 ⁻⁴	
$\Gamma_{10} \chi_{c2}$ anything	(3.4 ± 1.0) × 10 ⁻⁴	
$\Gamma_{11} \psi(2S)$ anything	(2.7 ± 0.9) × 10 ⁻⁴	

NODE=M171R01
NODE=M171R01

NODE=M171R01;LINKAGE=AU

NODE=M171R02
NODE=M171R02

NODE=M171

REFID=54288
REFID=54718
REFID=53231
REFID=53106
REFID=53062
REFID=52930
REFID=52262
REFID=51042
REFID=48577

NODE=M049

NODE=M049M

NODE=M049M

NODE=M049M;LINKAGE=AR
NODE=M049M;LINKAGE=A
NODE=M049M;LINKAGE=RZ
NODE=M049M;LINKAGE=G

NODE=M049W

NODE=M049W
→ UNCHECKED ←

NODE=M049215;NODE=M049

DESIG=3
DESIG=2
DESIG=1

NODE=M049;CLUMP=A
DESIG=117
DESIG=118
DESIG=73
DESIG=12
DESIG=5
DESIG=6
DESIG=7
DESIG=8

Γ_{12}	$\rho\pi$	< 2	$\times 10^{-4}$	90%	DESIG=11
Γ_{13}	$\pi^+\pi^-$	< 5	$\times 10^{-4}$	90%	DESIG=23
Γ_{14}	K^+K^-	< 5	$\times 10^{-4}$	90%	DESIG=24
Γ_{15}	$p\bar{p}$	< 5	$\times 10^{-4}$	90%	DESIG=25
Γ_{16}	$\pi^0\pi^+\pi^-$	< 1.84	$\times 10^{-5}$	90%	DESIG=72
Γ_{17}	$D^*(2010)^\pm$ anything	(2.52 \pm 0.20) %			DESIG=30
Γ_{18}	\bar{d} anything	(2.86 \pm 0.28) $\times 10^{-5}$			DESIG=107
Γ_{19}	Sum of 100 exclusive modes	(1.200 \pm 0.017) %			DESIG=128
Radiative decays					
Γ_{20}	$\gamma\pi^+\pi^-$	(6.3 \pm 1.8) $\times 10^{-5}$			NODE=M049;CLUMP=B
Γ_{21}	$\gamma\pi^0\pi^0$	(1.7 \pm 0.7) $\times 10^{-5}$			DESIG=70
Γ_{22}	$\gamma\pi^0\eta$	< 2.4 $\times 10^{-6}$	90%		DESIG=71
Γ_{23}	γK^+K^-	[a] (1.14 \pm 0.13) $\times 10^{-5}$			DESIG=111
Γ_{24}	$\gamma p\bar{p}$	[b] < 6 $\times 10^{-6}$	90%		DESIG=102
Γ_{25}	$\gamma 2h^+2h^-$	(7.0 \pm 1.5) $\times 10^{-4}$			DESIG=103
Γ_{26}	$\gamma 3h^+3h^-$	(5.4 \pm 2.0) $\times 10^{-4}$			DESIG=20
Γ_{27}	$\gamma 4h^+4h^-$	(7.4 \pm 3.5) $\times 10^{-4}$			DESIG=21
Γ_{28}	$\gamma\pi^+\pi^-K^+K^-$	(2.9 \pm 0.9) $\times 10^{-4}$			DESIG=22
Γ_{29}	$\gamma 2\pi^+2\pi^-$	(2.5 \pm 0.9) $\times 10^{-4}$			DESIG=14
Γ_{30}	$\gamma 3\pi^+3\pi^-$	(2.5 \pm 1.2) $\times 10^{-4}$			DESIG=13
Γ_{31}	$\gamma 2\pi^+2\pi^-K^+K^-$	(2.4 \pm 1.2) $\times 10^{-4}$			DESIG=17
Γ_{32}	$\gamma\pi^+\pi^-p\bar{p}$	(1.5 \pm 0.6) $\times 10^{-4}$			DESIG=18
Γ_{33}	$\gamma 2\pi^+2\pi^-p\bar{p}$	(4 \pm 6) $\times 10^{-5}$			DESIG=15
Γ_{34}	$\gamma 2K^+2K^-$	(2.0 \pm 2.0) $\times 10^{-5}$			DESIG=19
Γ_{35}	$\gamma\eta'(958)$	< 1.9 $\times 10^{-6}$	90%		DESIG=55
Γ_{36}	$\gamma\eta$	< 1.0 $\times 10^{-6}$	90%		DESIG=54
Γ_{37}	$\gamma f_0(980)$	< 3 $\times 10^{-5}$	90%		DESIG=105
Γ_{38}	$\gamma f'_2(1525)$	(3.8 \pm 0.9) $\times 10^{-5}$			DESIG=52
Γ_{39}	$\gamma f_2(1270)$	(1.01 \pm 0.09) $\times 10^{-4}$			DESIG=51
Γ_{40}	$\gamma\eta(1405)$	< 8.2 $\times 10^{-5}$	90%		DESIG=65
Γ_{41}	$\gamma f_0(1500)$	< 1.5 $\times 10^{-5}$	90%		DESIG=108
Γ_{42}	$\gamma f_0(1710)$	< 2.6 $\times 10^{-4}$	90%		DESIG=53
Γ_{43}	$\gamma f_0(1710) \rightarrow \gamma K^+K^-$	< 7 $\times 10^{-6}$	90%		DESIG=112
Γ_{44}	$\gamma f_0(1710) \rightarrow \gamma\pi^0\pi^0$	< 1.4 $\times 10^{-6}$	90%		DESIG=109
Γ_{45}	$\gamma f_0(1710) \rightarrow \gamma\eta\eta$	< 1.8 $\times 10^{-6}$	90%		DESIG=110
Γ_{46}	$\gamma f_4(2050)$	< 5.3 $\times 10^{-5}$	90%		DESIG=104
Γ_{47}	$\gamma f_0(2200) \rightarrow \gamma K^+K^-$	< 2 $\times 10^{-4}$	90%		DESIG=104
Γ_{48}	$\gamma f_0(2220) \rightarrow \gamma K^+K^-$	< 8 $\times 10^{-7}$	90%		DESIG=69
Γ_{49}	$\gamma f_0(2220) \rightarrow \gamma\pi^+\pi^-$	< 6 $\times 10^{-7}$	90%		DESIG=60
Γ_{50}	$\gamma f_0(2220) \rightarrow \gamma p\bar{p}$	< 1.1 $\times 10^{-6}$	90%		DESIG=61
Γ_{51}	$\gamma\eta(2225) \rightarrow \gamma\phi\phi$	< 3 $\times 10^{-3}$	90%		DESIG=62
Γ_{52}	$\gamma\eta_c(1S)$	< 5.7 $\times 10^{-5}$	90%		DESIG=68
Γ_{53}	$\gamma\chi_{c0}$	< 6.5 $\times 10^{-4}$	90%		DESIG=119
Γ_{54}	$\gamma\chi_{c1}$	< 2.3 $\times 10^{-5}$	90%		DESIG=120
Γ_{55}	$\gamma\chi_{c2}$	< 7.6 $\times 10^{-6}$	90%		DESIG=121
Γ_{56}	$\gamma X(3872) \rightarrow \pi^+\pi^-J/\psi$	< 1.6 $\times 10^{-6}$	90%		DESIG=122
Γ_{57}	$\gamma X(3872) \rightarrow \pi^+\pi^-\pi^0J/\psi$	< 2.8 $\times 10^{-6}$	90%		DESIG=123
Γ_{58}	$\gamma X(3915) \rightarrow \omega J/\psi$	< 3.0 $\times 10^{-6}$	90%		DESIG=124
Γ_{59}	$\gamma X(4140) \rightarrow \phi J/\psi$	< 2.2 $\times 10^{-6}$	90%		DESIG=125
Γ_{60}	γX	[c] < 4.5 $\times 10^{-6}$	90%		DESIG=126
Γ_{61}	$\gamma X\bar{X} (m_X < 3.1 \text{ GeV})$	[d] < 1 $\times 10^{-3}$	90%		DESIG=66
Γ_{62}	$\gamma X\bar{X} (m_X < 4.5 \text{ GeV})$	[e] < 2.4 $\times 10^{-4}$	90%		DESIG=67
Γ_{63}	$\gamma X \rightarrow \gamma + \geq 4 \text{ prongs}$	[f] < 1.78 $\times 10^{-4}$	95%		DESIG=127
Γ_{64}	$\gamma a_1^0 \rightarrow \gamma\mu^+\mu^-$	[g] < 9 $\times 10^{-6}$	90%		DESIG=113
Γ_{65}	$\gamma a_1^0 \rightarrow \gamma\tau^+\tau^-$	[a] < 5.0 $\times 10^{-5}$	90%		DESIG=114
Lepton Family number (<i>LF</i>) violating modes					
Γ_{66}	$\mu^\pm\tau^\mp$	<i>LF</i> < 6.0 $\times 10^{-6}$	95%		NODE=M049;CLUMP=C
					DESIG=116

Other decays

Γ_{67} invisible	< 3.0	$\times 10^{-4}$	90%
[a] $2m_\tau < M(\tau^+ \tau^-) < 7500$ MeV			
[b] $2 < m_{K^+ K^-} < 3$ GeV			
[c] $X =$ scalar with $m < 8.0$ GeV			
[d] $X \bar{X} =$ vectors with $m < 3.1$ GeV			
[e] X and $\bar{X} =$ zero spin with $m < 4.5$ GeV			
[f] $1.5 \text{ GeV} < m_X < 5.0 \text{ GeV}$			
[g] $201 < M(\mu^+ \mu^-) < 3565$ MeV			

NODE=M049;CLUMP=D

DESIG=106

LINKAGE=E49

LINKAGE=G49

LINKAGE=A49

LINKAGE=B49

LINKAGE=F49

LINKAGE=C49

LINKAGE=D49

 $\Upsilon(1S)$ $\Gamma(i)\Gamma(e^+ e^-)/\Gamma(\text{total})$

$\Gamma(e^+ e^-) \times \Gamma(\mu^+ \mu^-)/\Gamma_{\text{total}}$	$\Gamma_2 \Gamma_3/\Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT
$31.2 \pm 1.6 \pm 1.7$	KOBEL	92	$e^+ e^- \rightarrow \mu^+ \mu^-$

NODE=M049218

NODE=M049G1

NODE=M049G1

$\Gamma(\text{hadrons}) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$	$\Gamma_0 \Gamma_2/\Gamma$		
VALUE (keV)	DOCUMENT ID	TECN	COMMENT
1.240 ± 0.016 OUR AVERAGE			

NODE=M049G2

NODE=M049G2

1.252 $\pm 0.004 \pm 0.019$	5 ROSNER	06	CLEO	$9.5 \text{ } e^+ e^- \rightarrow \text{hadrons}$
1.187 $\pm 0.023 \pm 0.031$	5 BARU	92B	MD1	$e^+ e^- \rightarrow \text{hadrons}$
1.23 $\pm 0.02 \pm 0.05$	5 JAKUBOWSKI	88	CBAL	$e^+ e^- \rightarrow \text{hadrons}$
1.37 $\pm 0.06 \pm 0.09$	6 GILES	84B	CLEO	$e^+ e^- \rightarrow \text{hadrons}$
1.23 $\pm 0.08 \pm 0.04$	6 ALBRECHT	82	DASP	$e^+ e^- \rightarrow \text{hadrons}$
1.13 $\pm 0.07 \pm 0.11$	6 NICZYPORUK	82	LENA	$e^+ e^- \rightarrow \text{hadrons}$
1.09 ± 0.25	6 BOCK	80	CNTR	$e^+ e^- \rightarrow \text{hadrons}$
1.35 ± 0.14	7 BERGER	79	PLUT	$e^+ e^- \rightarrow \text{hadrons}$

5 Radiative corrections evaluated following KURAEV 85.

6 Radiative corrections reevaluated by BUCHMUELLER 88 following KURAEV 85.

7 Radiative corrections reevaluated by ALEXANDER 89 using $B(\mu\mu) = 0.026$.

NODE=M049G2;LINKAGE=B

NODE=M049G2;LINKAGE=R

NODE=M049G2;LINKAGE=P

 $\Upsilon(1S)$ PARTIAL WIDTHS

$\Gamma(e^+ e^-)$	Γ_2		
VALUE (keV)	DOCUMENT ID	TECN	COMMENT
1.340 ± 0.018 OUR EVALUATION			

NODE=M049220

NODE=M049W2

NODE=M049W2

→ UNCHECKED ←

 $\Upsilon(1S)$ BRANCHING RATIOS

$\Gamma(\tau^+ \tau^-)/\Gamma_{\text{total}}$	Γ_1/Γ			
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.60 ± 0.10 OUR AVERAGE				
2.53 $\pm 0.13 \pm 0.05$	60k	8 BESSON	07	$e^+ e^- \rightarrow \Upsilon(1S) \rightarrow \tau^+ \tau^-$
2.61 $\pm 0.12^{+0.09}_{-0.13}$	25k	CINABRO	94B	$e^+ e^- \rightarrow \tau^+ \tau^-$
2.7 $\pm 0.4 \pm 0.2$	9 ALBRECHT	85C	ARG	$\Upsilon(2S) \rightarrow \pi^+ \pi^- \tau^+ \tau^-$
3.4 $\pm 0.4 \pm 0.4$	GILES	83	CLEO	$e^+ e^- \rightarrow \tau^+ \tau^-$

NODE=M049R3

NODE=M049R3

8 BESSON 07 reports $[\Gamma(\Upsilon(1S) \rightarrow \tau^+ \tau^-)/\Gamma_{\text{total}}]/[B(\Upsilon(1S) \rightarrow \mu^+ \mu^-)] = 1.02 \pm 0.02 \pm 0.05$ which we multiply by our best value $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

9 Using $B(\Upsilon(1S) \rightarrow ee) = B(\Upsilon(1S) \rightarrow \mu\mu) = 0.0256$; not used for width evaluations.

NODE=M049R3;LINKAGE=BE

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$	Γ_2/Γ			
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.38 ± 0.11 OUR AVERAGE				
2.29 $\pm 0.08 \pm 0.11$		ALEXANDER	98	$\Upsilon(2S) \rightarrow \pi^+ \pi^- e^+ e^-$
2.42 $\pm 0.14 \pm 0.14$	307	ALBRECHT	87	$\Upsilon(2S) \rightarrow \pi^+ \pi^- e^+ e^-$
2.8 $\pm 0.3 \pm 0.2$	826	BESSON	84	$\Upsilon(2S) \rightarrow \pi^+ \pi^- e^+ e^-$
5.1 ± 3.0		BERGER	80C	$e^+ e^- \rightarrow e^+ e^-$

NODE=M049R2

NODE=M049R2

→ UNCHECKED ←

NODE=M049R3;LINKAGE=A

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$		Γ_3/Γ		NODE=M049R1 NODE=M049R1	
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.0248±0.0005 OUR AVERAGE					
0.0249±0.0002±0.0007	345k	ADAMS 05	CLEO	$e^+e^- \rightarrow \mu^+\mu^-$	
0.0249±0.0008±0.0013		ALEXANDER 98	CLE2	$\gamma(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$	
0.0212±0.0020±0.0010		10 BARU 92	MD1	$e^+e^- \rightarrow \mu^+\mu^-$	
0.0231±0.0012±0.0010		10 KOBEL 92	CBAL	$e^+e^- \rightarrow \mu^+\mu^-$	
0.0252±0.0007±0.0007		CHEN 89B	CLEO	$e^+e^- \rightarrow \mu^+\mu^-$	
0.0261±0.0009±0.0011		KAARSBERG 89	CSB2	$e^+e^- \rightarrow \mu^+\mu^-$	
0.0230±0.0025±0.0013	86	ALBRECHT 87	ARG	$\gamma(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$	
0.029 ± 0.003 ± 0.002	864	BESSON 84	CLEO	$\gamma(2S) \rightarrow \pi^+\pi^-\mu^+\mu^-$	
0.027 ± 0.003 ± 0.003		ANDREWS 83	CLEO	$e^+e^- \rightarrow \mu^+\mu^-$	
0.032 ± 0.013 ± 0.003		ALBRECHT 82	DASP	$e^+e^- \rightarrow \mu^+\mu^-$	
0.038 ± 0.015 ± 0.002		NICZYPORUK 82	LENA	$e^+e^- \rightarrow \mu^+\mu^-$	
0.014 +0.034 -0.014		BOCK 80	CNTR	$e^+e^- \rightarrow \mu^+\mu^-$	
0.022 ± 0.020		BERGER 79	PLUT	$e^+e^- \rightarrow \mu^+\mu^-$	
10 Taking into account interference between the resonance and continuum.					
$\Gamma(\tau^+\tau^-)/\Gamma(\mu^+\mu^-)$		Γ_1/Γ_3		NODE=M049R1;LINKAGE=G	
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
1.008±0.023 OUR AVERAGE					
1.005±0.013±0.022	0.7M	11 DEL-AMO-SA..10C	BABR	$\gamma(3S) \rightarrow \pi^+\pi^-\gamma(1S)$	
1.02 ± 0.02 ± 0.05	60k	BESSON 07	CLEO	$e^+e^- \rightarrow \gamma(1S)$	
11 Allows any number of extra photons with total energy < 500 MeV.					
$\Gamma(ggg)/\Gamma_{\text{total}}$		Γ_4/Γ		NODE=M049R43;LINKAGE=G	
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
81.7±0.7	20M	12 BESSON	06A CLEO	$\gamma(1S) \rightarrow \text{hadrons}$	
12 Calculated using the value $\Gamma(\gamma gg)/\Gamma(ggg) = (2.70 \pm 0.01 \pm 0.13 \pm 0.24)\%$ from BESSON 06A and PDG 08 values of $B(\mu^+\mu^-) = (4.48 \pm 0.05)\%$ and $R_{\text{hadrons}} = 3.51$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(\gamma gg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.					
$\Gamma(\gamma gg)/\Gamma_{\text{total}}$		Γ_5/Γ		NODE=M049R35;LINKAGE=G	
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.20±0.60	400k	13 BESSON	06A CLEO	$\gamma(1S) \rightarrow \gamma + \text{hadrons}$	
13 Calculated using BESSON 06A values of $\Gamma(\gamma gg)/\Gamma(ggg) = (2.70 \pm 0.01 \pm 0.13 \pm 0.24)\%$ and $\Gamma(ggg)/\Gamma_{\text{total}}$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.					
$\Gamma(\gamma gg)/\Gamma(ggg)$		Γ_5/Γ_4		NODE=M049R36;LINKAGE=G	
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.70±0.01±0.27	20M	BESSON 06A	CLEO	$\gamma(1S) \rightarrow (\gamma +) \text{hadrons}$	
14 Calculated using BESSON 06A values of $\Gamma(\gamma gg)/\Gamma(ggg) = (2.70 \pm 0.01 \pm 0.13 \pm 0.24)\%$ and $\Gamma(ggg)/\Gamma_{\text{total}}$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.					
$\Gamma(\eta'(958) \text{ anything})/\Gamma_{\text{total}}$		Γ_6/Γ		NODE=M049R73;LINKAGE=G	
VALUE		DOCUMENT ID	TECN	COMMENT	
0.0294±0.0024 OUR AVERAGE					
0.030 ± 0.002 ± 0.002		AQUINES 06A	CLE3	$\gamma(1S) \rightarrow \eta' \text{ anything}$	
0.028 ± 0.004 ± 0.002		ARTUSO 03	CLE2	$\gamma(1S) \rightarrow \eta' \text{ anything}$	
$\Gamma(J/\psi(1S) \text{ anything})/\Gamma_{\text{total}}$		Γ_7/Γ		NODE=M049R12;LINKAGE=G	
VALUE (units 10^{-3})	CL %	EVTS	DOCUMENT ID	TECN	COMMENT
0.65±0.07 OUR AVERAGE					
0.64±0.04±0.06		14 BRIERE 04	CLEO	$e^+e^- \rightarrow J/\psi X$	
1.1 ± 0.4 ± 0.2		FULTON 89	CLEO	$e^+e^- \rightarrow \mu^+\mu^- X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.68	90	ALBRECHT 92J	ARG	$e^+e^- \rightarrow e^+e^- X$	
<1.7	90	MASCHMANN 90	CBAL	$e^+e^- \rightarrow \mu^+\mu^- X$	
<20	90	NICZYPORUK 83	LENA	$e^+e^- \rightarrow \text{hadrons}$	
14 Using $B((J/\psi) \rightarrow \mu^+\mu^-) = (6.9 \pm 0.9)\%$					

$\Gamma(\chi_{c0} \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$					Γ_8/Γ_7	NODE=M049R25 NODE=M049R25
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<7.4	90	BRIERE	04	CLEO	$e^+ e^- \rightarrow J/\psi X$	
$\Gamma(\chi_{c1} \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$					Γ_9/Γ_7	NODE=M049R26 NODE=M049R26
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.35±0.08±0.06	52 ± 12	BRIERE	04	CLEO	$e^+ e^- \rightarrow J/\psi X$	
$\Gamma(\chi_{c2} \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$					Γ_{10}/Γ_7	NODE=M049R27 NODE=M049R27
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.52±0.12±0.09	47 ± 11	BRIERE	04	CLEO	$e^+ e^- \rightarrow J/\psi X$	
$\Gamma(\psi(2S) \text{ anything})/\Gamma(J/\psi(1S) \text{ anything})$					Γ_{11}/Γ_7	NODE=M049R28 NODE=M049R28
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.41±0.11±0.08	42 ± 11	BRIERE	04	CLEO	$e^+ e^- \rightarrow J/\psi \pi^+ \pi^- X$	
$\Gamma(\rho\pi)/\Gamma_{\text{total}}$					Γ_{12}/Γ	NODE=M049R11 NODE=M049R11
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
< 2	90	FULTON	90B		$\gamma(1S) \rightarrow \rho^0 \pi^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<10	90	BLINOV	90	MD1	$\gamma(1S) \rightarrow \rho^0 \pi^0$	
<21	90	NICZYPORUK	83	LENA	$\gamma(1S) \rightarrow \rho^0 \pi^0$	
$\Gamma(\pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{13}/Γ	NODE=M049R57 NODE=M049R57
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<5	90	BARU	92	MD1	$\gamma(1S) \rightarrow \pi^+ \pi^-$	
$\Gamma(K^+ K^-)/\Gamma_{\text{total}}$					Γ_{14}/Γ	NODE=M049R58 NODE=M049R58
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<5	90	BARU	92	MD1	$\gamma(1S) \rightarrow K^+ K^-$	
$\Gamma(p\bar{p})/\Gamma_{\text{total}}$					Γ_{15}/Γ	NODE=M049R59 NODE=M049R59
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<5	90	15 BARU	96	MD1	$\gamma(1S) \rightarrow p\bar{p}$	
15 Supersedes BARU 92 in this node.						
$\Gamma(\pi^0 \pi^+ \pi^-)/\Gamma_{\text{total}}$					Γ_{16}/Γ	NODE=M049R72 NODE=M049R72
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
<1.84	90	ANASTASSOV	99	CLE2	$e^+ e^- \rightarrow \text{hadrons}$	
$\Gamma(D^*(2010)^{\pm} \text{ anything})/\Gamma_{\text{total}}$					Γ_{17}/Γ	NODE=M049R32 NODE=M049R32
<u>VALUE (units 10^{-3})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
25.2±1.3±1.5	≈ 2k	16 AUBERT	10C BABR		$\gamma(2S) \rightarrow \pi^+ \pi^- \gamma(1S)$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<19	90	17 ALBRECHT	92J ARG		$e^+ e^- \rightarrow D^0 \pi^{\pm} X$	
16 For $x_p > 0.1$.						
17 For $x_p > 0.2$.						
$\Gamma(\bar{d} \text{ anything})/\Gamma_{\text{total}}$					Γ_{18}/Γ	NODE=M049R33 NODE=M049R33
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
2.86±0.19±0.21	455	ASNER	07	CLEO	$e^+ e^- \rightarrow \bar{d} X$	
$\Gamma(\text{Sum of 100 exclusive modes})/\Gamma_{\text{total}}$					Γ_{19}/Γ	NODE=M049R02 NODE=M049R02
<u>VALUE (units 10^{-2})</u>		<u>DOCUMENT ID</u>		<u>COMMENT</u>		
1.200±0.017		18,19 DOBBS	12A		$\gamma(1S) \rightarrow \text{hadrons}$	
18 DOBBS 12A presents individual exclusive branching fractions or upper limits for 100 modes of four to ten pions, kaons, or protons.						
19 Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.						
$\Gamma(ggg, \gamma gg \rightarrow \bar{d} \text{ anything})/\Gamma(ggg, \gamma gg \rightarrow \text{anything})$						NODE=M049R34 NODE=M049R34
<u>VALUE (units 10^{-5})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
3.36±0.23±0.25	455	ASNER	07	CLEO	$e^+ e^- \rightarrow \bar{d} X$	

$\Gamma(\gamma\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{20}/Γ	NODE=M049R70 NODE=M049R70
<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
6.3±1.2±1.3	20 ANASTASSOV 99 CLE2 $e^+e^- \rightarrow \text{hadrons}$	
20 For $m_{\pi\pi} > 1 \text{ GeV}$.		
$\Gamma(\gamma\pi^0\pi^0)/\Gamma_{\text{total}}$	Γ_{21}/Γ	NODE=M049R70;LINKAGE=A
<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
1.7±0.6±0.3	21 ANASTASSOV 99 CLE2 $e^+e^- \rightarrow \text{hadrons}$	
21 For $m_{\pi\pi} > 1 \text{ GeV}$.		
$\Gamma(\gamma\pi^0\eta)/\Gamma_{\text{total}}$	Γ_{22}/Γ	NODE=M049R71;LINKAGE=A
<u>VALUE (units 10^{-6})</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
<2.4 90	22 BESSON 07A CLEO $e^+e^- \rightarrow \gamma(1S)$	
22 BESSON 07A obtained this limit for $0.7 < m_{\pi^0\eta} < 3 \text{ GeV}$.		
$\Gamma(\gamma K^+K^-)/\Gamma_{\text{total}}$	Γ_{23}/Γ	NODE=M049R47;LINKAGE=BE
$(2 < m_{K^+K^-} < 3 \text{ GeV})$		
<u>VALUE (units 10^{-5})</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
1.14±0.08±0.10 90	ATHAR 06 CLE3 $\gamma(1S) \rightarrow \gamma K^+K^-$	
$\Gamma(\gamma p\bar{p})/\Gamma_{\text{total}}$	Γ_{24}/Γ	NODE=M049R24
$(2 < m_{p\bar{p}} < 3 \text{ GeV})$		
<u>VALUE (units 10^{-5})</u> <u>CL%</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
<0.6 90	ATHAR 06 CLE3 $\gamma(1S) \rightarrow \gamma p\bar{p}$	
$\Gamma(\gamma 2h^+2h^-)/\Gamma_{\text{total}}$	Γ_{25}/Γ	NODE=M049R24
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
7.0±1.1±1.0 80 ± 12	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma 3h^+3h^-)/\Gamma_{\text{total}}$	Γ_{26}/Γ	NODE=M049R21
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
5.4±1.5±1.3 39 ± 11	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma 4h^+4h^-)/\Gamma_{\text{total}}$	Γ_{27}/Γ	NODE=M049R22
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
7.4±2.5±2.5 36 ± 12	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma\pi^+\pi^-K^+K^-)/\Gamma_{\text{total}}$	Γ_{28}/Γ	NODE=M049R14
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
2.9±0.7±0.6 29 ± 8	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma 2\pi^+2\pi^-)/\Gamma_{\text{total}}$	Γ_{29}/Γ	NODE=M049R13
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
2.5±0.7±0.5 26 ± 7	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma 3\pi^+3\pi^-)/\Gamma_{\text{total}}$	Γ_{30}/Γ	NODE=M049R17
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
2.5±0.9±0.8 17 ± 5	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma 2\pi^+2\pi^-K^+K^-)/\Gamma_{\text{total}}$	Γ_{31}/Γ	NODE=M049R18
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
2.4±0.9±0.8 18 ± 7	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma\pi^+\pi^-p\bar{p})/\Gamma_{\text{total}}$	Γ_{32}/Γ	NODE=M049R15
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
1.5±0.5±0.3 22 ± 6	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	
$\Gamma(\gamma 2\pi^+2\pi^-p\bar{p})/\Gamma_{\text{total}}$	Γ_{33}/Γ	NODE=M049R19
<u>VALUE (units 10^{-4})</u> <u>EVTS</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>	
0.4±0.4±0.4 7 ± 6	FULTON 90B CLEO $e^+e^- \rightarrow \text{hadrons}$	

$\Gamma(\gamma 2K^+ 2K^-)/\Gamma_{\text{total}}$					Γ_{34}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
0.2 ± 0.2	2 ± 2	FULTON	90B	CLEO	$e^+ e^- \rightarrow \text{hadrons}$

NODE=M049R16
NODE=M049R16

$\Gamma(\gamma\eta'(958))/\Gamma_{\text{total}}$					Γ_{35}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
< 1.9	90	ATHAR	07A	CLEO	$\gamma(1S) \rightarrow \gamma\eta' \rightarrow \gamma\pi^+\pi^-\eta, \gamma\rho$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<16	90	RICHICHI	01B	CLE2	$\gamma(1S) \rightarrow \gamma\eta' \rightarrow \gamma\eta\pi^+\pi^-$

NODE=M049R55
NODE=M049R55

$\Gamma(\gamma\eta)/\Gamma_{\text{total}}$					Γ_{36}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
< 1.0	90	ATHAR	07A	CLEO	$\gamma(1S) \rightarrow \gamma\eta \rightarrow \gamma\gamma\gamma, \gamma\pi^+\pi^-\pi^0, \gamma 3\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<21	90	MASEK	02	CLEO	$\gamma(1S) \rightarrow \gamma\eta$

NODE=M049R54
NODE=M049R54

$\Gamma(\gamma f_0(980))/\Gamma_{\text{total}}$					Γ_{37}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<3	90	23 ATHAR	06	CLE3	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$
23 Assuming $B(f_0(980) \rightarrow \pi\pi) = 1$.					

NODE=M049R31
NODE=M049R31

$\Gamma(\gamma f'_2(1525))/\Gamma_{\text{total}}$					Γ_{38}/Γ
VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
3.8 ± 0.9 OUR AVERAGE					
4.0 $\pm 1.4 \pm 0.1$	17 ± 5	24 BESSON	11	CLEO	$\gamma(1S) \rightarrow K_S^0 K_S^0$
$3.7^{+0.9}_{-0.7} \pm 0.8$		ATHAR	06	CLE3	$\gamma(1S) \rightarrow \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<14	90	25 FULTON	90B	CLEO	$\gamma(1S) \rightarrow \gamma K^+ K^-$
<19.4	90	25 ALBRECHT	89	ARG	$\gamma(1S) \rightarrow \gamma K^+ K^-$

NODE=M049R31;LINKAGE=AT

NODE=M049R52
NODE=M049R52

24 BESSON 11 reports $(4.0 \pm 1.3 \pm 0.6) \times 10^{-5}$ from a measurement of $[\Gamma(\gamma(1S) \rightarrow \gamma f'_2(1525))/\Gamma_{\text{total}}] \times [B(f'_2(1525) \rightarrow K\bar{K})]$ assuming $B(f'_2(1525) \rightarrow K\bar{K}) = (88.8 \pm 3.1) \times 10^{-2}$, which we rescale to our best value $B(f'_2(1525) \rightarrow K\bar{K}) = (88.7 \pm 2.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. The result also assumes $B(K_S^0 \rightarrow \pi^+\pi^-) = (69.20 \pm 0.05)\%$ and $B(f'_2(1525) \rightarrow K\bar{K}) = 4 B(f'_2(1525) \rightarrow K_S^0 K_S^0)$.
25 Assuming $B(f'_2(1525) \rightarrow K\bar{K}) = 0.71$.

NODE=M049R52;LINKAGE=BE

$\Gamma(\gamma f_2(1270))/\Gamma_{\text{total}}$					Γ_{39}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
10.1 ± 0.9 OUR AVERAGE					
10.5 $\pm 1.6^{+1.9}_{-1.8}$		26 BESSON	07A	CLE3	$\gamma(1S) \rightarrow \gamma\pi^0\pi^0$
10.2 $\pm 0.8 \pm 0.7$		ATHAR	06	CLE3	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$
8.1 $\pm 2.3^{+2.9}_{-2.7}$		27 ANASTASSOV	99	CLE2	$e^+ e^- \rightarrow \text{hadrons}$

NODE=M049R52;LINKAGE=D

NODE=M049R51
NODE=M049R51

• • • We do not use the following data for averages, fits, limits, etc. • • •					
<21	90	27 FULTON	90B	CLEO	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$
<13	90	27 ALBRECHT	89	ARG	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$
<81	90	SCHMITT	88	CBAL	$\gamma(1S) \rightarrow \gamma X$
26 Using $B(f_2(1270) \rightarrow \pi^0\pi^0) = B(f_2(1270) \rightarrow \pi\pi)/3$ and $B(f_2(1270) \rightarrow \pi\pi) = (0.845^{+0.025}_{-0.012})\%$.					
27 Using $B(f_2(1270) \rightarrow \pi\pi) = 0.84$.					

NODE=M049R51;LINKAGE=BE

NODE=M049R51;LINKAGE=C

$\Gamma(\gamma\eta(1405))/\Gamma_{\text{total}}$					Γ_{40}/Γ
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	
<8.2	90	28 FULTON	90B	CLEO	$\gamma(1S) \rightarrow \gamma K^\pm \pi^\mp K_S^0$
28 Includes unknown branching ratio of $\eta(1405) \rightarrow K^\pm \pi^\mp K_S^0$.					

NODE=M049R23;LINKAGE=J

$\Gamma(\gamma f_0(1500))/\Gamma_{\text{total}}$					Γ_{41}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.5	90	29 BESSON	07A CLEO	$e^+ e^- \rightarrow \gamma(1S) \rightarrow \gamma\pi^0\pi^0$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<6.1	90	30 BESSON	07A CLEO	$e^+ e^- \rightarrow \gamma(1S) \rightarrow \gamma\eta\eta$	
29 Using $B(f_0(1500) \rightarrow \pi^0\pi^0) = B(f_0(1500) \rightarrow \pi\pi)/3$ and $B(f_0(1500) \rightarrow \pi\pi) = (0.349 \pm 0.023)\%$.					
30 Calculated by us using $B(f_0(1500) \rightarrow \eta\eta) = (5.1 \pm 0.9)\%$.					

NODE=M049R44
NODE=M049R44

$\Gamma(\gamma f_0(1710))/\Gamma_{\text{total}}$					Γ_{42}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 2.6	90	31 ALBRECHT	89 ARG	$\gamma(1S) \rightarrow \gamma K^+ K^-$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
< 6.3	90	31 FULTON	90B CLEO	$\gamma(1S) \rightarrow \gamma K^+ K^-$	
<19	90	31 FULTON	90B CLEO	$\gamma(1S) \rightarrow \gamma K_S^0 K_S^0$	
< 8	90	32 ALBRECHT	89 ARG	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$	
<24	90	33 SCHMITT	88 CBAL	$\gamma(1S) \rightarrow \gamma X$	
31 Assuming $B(f_0(1710) \rightarrow K\bar{K}) = 0.38$.					
32 Assuming $B(f_0(1710) \rightarrow \pi\pi) = 0.04$.					
33 Assuming $B(f_0(1710) \rightarrow \eta\eta) = 0.18$.					

NODE=M049R53
NODE=M049R53

$\Gamma(\gamma f_0(1710) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$					Γ_{43}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.7	90	ATHAR	06 CLEO	$e^+ e^- \rightarrow \gamma(1S) \rightarrow \gamma K^+ K^-$	

NODE=M049R50
NODE=M049R50

$\Gamma(\gamma f_0(1710) \rightarrow \gamma\pi^0\pi^0)/\Gamma_{\text{total}}$					Γ_{44}/Γ
<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.4	90	BESSON	07A CLEO	$e^+ e^- \rightarrow \gamma(1S) \rightarrow \gamma\pi^0\pi^0$	

NODE=M049R45
NODE=M049R45

$\Gamma(\gamma f_0(1710) \rightarrow \gamma\eta\eta)/\Gamma_{\text{total}}$					Γ_{45}/Γ
<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.8	90	BESSON	07A CLEO	$e^+ e^- \rightarrow \gamma(1S) \rightarrow \gamma\eta\eta$	

NODE=M049R46
NODE=M049R46

$\Gamma(\gamma f_4(2050))/\Gamma_{\text{total}}$					Γ_{46}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<5.3	90	34 ATHAR	06 CLE3	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$	

NODE=M049R30
NODE=M049R30

34 Assuming $B(f_4(2050) \rightarrow \pi\pi) = 0.17$.

NODE=M049R30;LINKAGE=AT

$\Gamma(\gamma f_0(2200) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$					Γ_{47}/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.0002	90	BARU	89 MD1	$\gamma(1S) \rightarrow \gamma K^+ K^-$	

NODE=M049R63
NODE=M049R63

$\Gamma(\gamma f_J(2220) \rightarrow \gamma K^+ K^-)/\Gamma_{\text{total}}$					Γ_{48}/Γ
<u>VALUE (units 10^{-7})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 8	90	ATHAR	06 CLE3	$\gamma(1S) \rightarrow \gamma K^+ K^-$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
< 160	90	MASEK	02 CLEO	$\gamma(1S) \rightarrow \gamma K^+ K^-$	
< 150	90	FULTON	90B CLEO	$\gamma(1S) \rightarrow \gamma K^+ K^-$	
< 290	90	ALBRECHT	89 ARG	$\gamma(1S) \rightarrow \gamma K^+ K^-$	
<2000	90	BARU	89 MD1	$\gamma(1S) \rightarrow \gamma K^+ K^-$	

NODE=M049R56
NODE=M049R56

$\Gamma(\gamma f_J(2220) \rightarrow \gamma\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{49}/Γ
<u>VALUE (units 10^{-7})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 6	90	ATHAR	06 CLE3	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<120	90	MASEK	02 CLEO	$\gamma(1S) \rightarrow \gamma\pi^+\pi^-$	

NODE=M049R41
NODE=M049R41

$\Gamma(\gamma f_J(2220) \rightarrow \gamma p\bar{p})/\Gamma_{\text{total}}$					Γ_{50}/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 11	90	ATHAR	06 CLE3	$\gamma(1S) \rightarrow \gamma p\bar{p}$	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<160	90	MASEK	02 CLEO	$\gamma(1S) \rightarrow \gamma p\bar{p}$	

NODE=M049R42
NODE=M049R42

$\Gamma(\gamma\eta(2225) \rightarrow \gamma\phi\phi)/\Gamma_{\text{total}}$					Γ_{51}/Γ	NODE=M049R62 NODE=M049R62
VALUE	CL%	DOCUMENT ID	TECN	COMMENT		
<0.003	90	BARU	89	MD1	$\gamma(1S) \rightarrow \gamma K^+ K^- K^+ K^-$	
$\Gamma(\gamma\eta_c(1S))/\Gamma_{\text{total}}$					Γ_{52}/Γ	NODE=M049R38 NODE=M049R38
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT		
<5.7	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma\chi_{c0})/\Gamma_{\text{total}}$					Γ_{53}/Γ	NODE=M049R39 NODE=M049R39
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT		
<6.5	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma\chi_{c1})/\Gamma_{\text{total}}$					Γ_{54}/Γ	NODE=M049R40 NODE=M049R40
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT		
<2.3	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma\chi_{c2})/\Gamma_{\text{total}}$					Γ_{55}/Γ	NODE=M049R48 NODE=M049R48
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT		
<7.6	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma X(3872) \rightarrow \pi^+ \pi^- J/\psi)/\Gamma_{\text{total}}$					Γ_{56}/Γ	NODE=M049R49 NODE=M049R49
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT		
<1.6	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma X(3872) \rightarrow \pi^+ \pi^- \pi^0 J/\psi)/\Gamma_{\text{total}}$					Γ_{57}/Γ	NODE=M049R68 NODE=M049R68
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT		
<2.8	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma X(3915) \rightarrow \omega J/\psi)/\Gamma_{\text{total}}$					Γ_{58}/Γ	NODE=M049R69 NODE=M049R69
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT		
<3.0	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma X(4140) \rightarrow \phi J/\psi)/\Gamma_{\text{total}}$					Γ_{59}/Γ	NODE=M049R74 NODE=M049R74
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT		
<2.2	90	SHEN	10A	BELL	$\gamma(1S) \rightarrow \gamma X$	
$\Gamma(\gamma X)/\Gamma_{\text{total}}$					Γ_{60}/Γ	NODE=M049R60
(X = scalar with $m < 8.0$ GeV)						NODE=M049R60 NODE=M049R60 NODE=M049R60
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT		
< 4.5	90	35 DEL-AMO-SA..11J	BABR	$e^+ e^- \rightarrow \gamma + X$		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<30	90	36 BAEST	95	CLEO	$e^+ e^- \rightarrow \gamma + X$	
35 For a noninteracting scalar X with mass $m < 8.0$ GeV.						NODE=M049R60;LINKAGE=DA
36 For a noninteracting pseudoscalar X with mass < 7.2 GeV.						NODE=M049R60;LINKAGE=A
$\Gamma(\gamma X\bar{X}(m_X < 3.1 \text{ GeV}))/\Gamma_{\text{total}}$					Γ_{61}/Γ	NODE=M049R61
(X \bar{X} = vectors with $m < 3.1$ GeV)						NODE=M049R61 NODE=M049R61 NODE=M049R61
VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT		
<1	90	37 BAEST	95	CLEO	$e^+ e^- \rightarrow \gamma + X\bar{X}$	
37 For a noninteracting vector X with mass < 3.1 GeV.						NODE=M049R61;LINKAGE=A
$\Gamma(\gamma X\bar{X}(m_X < 4.5 \text{ GeV}))/\Gamma_{\text{total}}$					Γ_{62}/Γ	NODE=M049R01
X and \bar{X} = zero spin with $m < 4.5$ GeV						NODE=M049R01 NODE=M049R01 NODE=M049R01
VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT		
<24	90	38 DEL-AMO-SA..11J	BABR	$e^+ e^- \rightarrow \gamma + X\bar{X}$		
38 For a noninteracting scalar X with mass $m < 4.5$ GeV.						NODE=M049R01;LINKAGE=DA
$\Gamma(\gamma X \rightarrow \gamma + \geq 4 \text{ prongs})/\Gamma_{\text{total}}$					Γ_{63}/Γ	NODE=M049R64
(1.5 GeV $< m_X < 5.0$ GeV)						NODE=M049R64 NODE=M049R64 NODE=M049R64
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT		
<1.78	95	ROSNER	07A	CLEO	$e^+ e^- \rightarrow \gamma X$	

$\Gamma(\gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-)/\Gamma_{\text{total}}$					Γ_{64}/Γ
(201 < M($\mu^+ \mu^-$) < 3565 MeV)					
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<9	90	39 LOVE	08 CLEO	$e^+ e^- \rightarrow \gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	NODE=M049R65 NODE=M049R65 NODE=M049R65
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<9.7	90	40 LEES	13C BABR	$e^+ e^- \rightarrow \gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	NODE=M049R65;LINKAGE=LO
39	For a narrow scalar or pseudoscalar a_1^0 with $201 < M(\mu^+ \mu^-) < 3565$ MeV, excluding J/ψ . Measured 90% CL limits as a function of $M(\mu^+ \mu^-)$ range from $1-9 \times 10^{-6}$.				
40	For a narrow scalar or pseudoscalar a_1^0 with mass in the range 212–9200 MeV, excluding J/ψ and $\psi(2S)$. Measured 90% CL limits as a function of $m_{a_1^0}$ range from $0.28-9.7 \times 10^{-6}$.				
$\Gamma(\gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-)/\Gamma_{\text{total}}$					Γ_{65}/Γ
(2m $_{\tau}$ < M($\tau^+ \tau^-$) < 7500 MeV)					
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<50	90	41 LOVE	08 CLEO	$e^+ e^- \rightarrow \gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-$	NODE=M049R66 NODE=M049R66 NODE=M049R66
41	For a narrow scalar or pseudoscalar a_1^0 with $2m_{\tau} < M(\tau^+ \tau^-) < 7500$ MeV. Measured 90% CL limits as a function of $M(\tau^+ \tau^-)$ range from $1-5 \times 10^{-5}$.				
LEPTON FAMILY NUMBER (LF) VIOLATING MODES					
$\Gamma(\mu^{\pm} \tau^{\mp})/\Gamma_{\text{total}}$					Γ_{66}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<6.0	95	LOVE	08A CLEO	$e^+ e^- \rightarrow \mu^{\pm} \tau^{\mp}$	NODE=M049R67 NODE=M049R67
OTHER DECAYS					
$\Gamma(\text{invisible})/\Gamma_{\text{total}}$					Γ_{67}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
< 3.0	90	AUBERT	09AX BABR	$\gamma(3S) \rightarrow \pi^+ \pi^- \gamma(1S)$	NODE=M049R10 NODE=M049R10
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<39	90	RUBIN	07 CLEO	$\gamma(2S) \rightarrow \pi^+ \pi^- \gamma(1S)$	
<25	90	TAJIMA	07 BELL	$\gamma(3S) \rightarrow \pi^+ \pi^- \gamma(1S)$	

$\gamma(1S)$ REFERENCES

LEES	13C	PR D87 031102	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54949
DOBBS	12A	PR D86 052003	S. Dobbs <i>et al.</i>	(CLEO Collab.)	REFID=54746
BESSON	11	PR D83 037101	D. Besson <i>et al.</i>	(BABAR Collab.)	REFID=16737
DEL-AMO-SA... 11J	PRL 107 021804	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=16495	
AUBERT	10C	PR D81 011102	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=53211
DEL-AMO-SA... 10C	PR D104 191801	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=53354	
SHEN	10A	PR D82 051504	C.P. Shen <i>et al.</i>	(BELLE Collab.)	REFID=53545
AUBERT	09AX	PRL 103 251801	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=53201
LOVE	08	PRL 101 151802	W. Love <i>et al.</i>	(CLEO Collab.)	REFID=52565
LOVE	08A	PRL 101 201601	W. Love <i>et al.</i>	(CLEO Collab.)	REFID=52592
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)	REFID=52166
ASNER	07	PR D75 012009	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=51617
ATHAR	07A	PR D76 072003	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=51945
BESSON	07	PRL 98 052002	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=51620
BESSON	07A	PR D75 072001	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=51638
ROSNER	07A	PR D76 117102	J.L. Rosner <i>et al.</i>	(CLEO Collab.)	REFID=52079
RUBIN	07	PR D75 031104	P. Rubin <i>et al.</i>	(CLEO Collab.)	REFID=51629
TAJIMA	07	PRL 98 132001	O. Tajima <i>et al.</i>	(BELLE Collab.)	REFID=51645
AQUINES	06A	PR D74 092006	O. Aquines <i>et al.</i>	(CLEO Collab.)	REFID=51510
ATHAR	06	PR D73 032001	S.B. Athar <i>et al.</i>	(CLEO Collab.)	REFID=50993
BESSON	06A	PR D74 012003	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=51147
ROSNER	06	PRL 96 092003	J.L. Rosner <i>et al.</i>	(CLEO Collab.)	REFID=51035
ADAMS	05	PR D94 012001	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=50452
BRIERE	04	PR D70 072001	R.A. Briere <i>et al.</i>	(CLEO Collab.)	REFID=50183
ARTUSO	03	PR D67 052003	M. Artuso <i>et al.</i>	(CLEO Collab.)	REFID=49395
MASEK	02	PR D65 072002	G. Masek <i>et al.</i>	(CLEO Collab.)	REFID=48846
RICHICHI	01B	PRL 87 141801	S.J. Richichi <i>et al.</i>	(CLEO Collab.)	REFID=48345
ARTAMONOV	00	PL B474 427	A.S. Artamonov <i>et al.</i>	(CLEO Collab.)	REFID=47424
ANASTASSOV	99	PRL 82 286	A. Anastassov <i>et al.</i>	(CLEO Collab.)	REFID=46609
ALEXANDER	98	PR D58 052004	J.P. Alexander <i>et al.</i>	(CLEO Collab.)	REFID=46329
BARU	96	PRPL 267 71	S.E. Baru <i>et al.</i>	(NOVO)	REFID=44651
BALEST	95	PR D51 2053	R. Balest <i>et al.</i>	(CLEO Collab.)	REFID=44146
CINABRO	94B	PL B340 129	D. Cinabro <i>et al.</i>	(CLEO Collab.)	REFID=44102
ALBRECHT	92J	ZPHY C55 25	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=42167
BARU	92	ZPHY C54 229	S.E. Baru <i>et al.</i>	(NOVO)	REFID=41860

NODE=M049

BARU	92B	ZPHY C56 547	S.E. Baru <i>et al.</i>	(NOVO)	REFID=42168
KOBEL	92	ZPHY C53 193	M. Kobel <i>et al.</i>	(Crystal Ball Collab.)	REFID=41861
BLINOV	90	PL B245 311	A.E. Blinov <i>et al.</i>	(NOVO)	REFID=41361
FULTON	90B	PR D41 1401	R. Fulton <i>et al.</i>	(CLEO Collab.)	REFID=41012
MASCHMANN	90	ZPHY C46 555	W.S. Maschmann <i>et al.</i>	(Crystal Ball Collab.)	REFID=41224
ALBRECHT	89	ZPHY C42 349	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=40731
ALEXANDER	89	NP B320 45	J.P. Alexander <i>et al.</i>	(LBL, MICH, SLAC)	REFID=40345
BARU	89	ZPHY C42 505	S.E. Baru <i>et al.</i>	(NOVO)	REFID=40917
CHEN	89B	PR D39 3528	W.Y. Chen <i>et al.</i>	(CLEO Collab.)	REFID=40919
FULTON	89	PL B224 445	R. Fulton <i>et al.</i>	(CLEO Collab.)	REFID=40918
KAARSBERG	89	PRL 62 2077	T.M. Kaarsberg <i>et al.</i>	(CUSB Collab.)	REFID=40733
BUCHMUELLER	88	HE e ⁺ e ⁻ Physics 412	W. Buchmueler, S. Cooper Editors: A. Ali and P. Soeding, World Scientific, Singapore	(HANN, DESY, MIT)	REFID=40034
JAKUBOWSKI	88	ZPHY C40 49	Z. Jakubowski <i>et al.</i>	(Crystal Ball Collab.)	REFID=40742
SCHMITT	88	ZPHY C40 199	P. Schmitt <i>et al.</i>	(Crystal Ball Collab.)	REFID=40582
ALBRECHT	87	ZPHY C35 283	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=40016
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)	REFID=11616
BARU	86	ZPHY C30 551	S.E. Baru <i>et al.</i>	(NOVO)	REFID=22284
ALBRECHT	85C	PL 154B 452	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=22282
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)	REFID=40033
ARTAMONOV	84	PL 137B 272	A.S. Artamonov <i>et al.</i>	(NOVO)	REFID=22278
BESSON	84	PR D30 1433	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=22279
GILES	84B	PR D29 1285	R. Giles <i>et al.</i>	(CLEO Collab.)	REFID=22280
MACKAY	84	PR D29 2483	W.W. MacKay <i>et al.</i>	(CUSB Collab.)	REFID=22281
ANDREWS	83	PRL 50 807	D.E. Andrews <i>et al.</i>	(CLEO Collab.)	REFID=22273
GILES	83	PRL 50 877	R. Giles <i>et al.</i>	(HARV, OSU, RÖCH, RUTG+)	REFID=22274
NICZYPORUK	83	ZPHY C17 197	B. Niczyporuk <i>et al.</i>	(LENA Collab.)	REFID=12488
ALBRECHT	82	PL 116B 383	H. Albrecht <i>et al.</i>	(DESY, DORT, HEIDH+)	REFID=22270
ARTAMONOV	82	PL 118B 225	A.S. Artamonov <i>et al.</i>	(NOVO)	REFID=22271
NICZYPORUK	82	ZPHY C15 299	B. Niczyporuk <i>et al.</i>	(LENA Collab.)	REFID=22272
BERGER	80C	PL 93B 497	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=22263
BOCK	80	ZPHY C6 125	P. Bock <i>et al.</i>	(HEIDP, MPIM, DESY, HAMB)	REFID=22264
BERGER	79	ZPHY C1 343	C. Berger <i>et al.</i>	(PLUTO Collab.)	REFID=22259

$\chi_{b0}(1P)$

$$\Gamma^G(JPC) = 0^+(0^{++})$$

J needs confirmation.

Observed in radiative decay of the $\Upsilon(2S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$.

$\chi_{b0}(1P)$ MASS

VALUE (MeV)	DOCUMENT ID	From average γ energy below, using $\Upsilon(2S)$ mass = 10023.26 ± 0.31 MeV		
9859.44 ± 0.42 ± 0.31 OUR EVALUATION				

γ ENERGY IN $\Upsilon(2S)$ DECAY

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
162.5 ± 0.4 OUR AVERAGE				
162.56 ± 0.19 ± 0.42	ARTUSO	05	CLEO $\Upsilon(2S) \rightarrow \gamma X$	
162.0 ± 0.8 ± 1.2	EDWARDS	99	CLE2 $\Upsilon(2S) \rightarrow \gamma \chi(1P)$	
162.1 ± 0.5 ± 1.4	ALBRECHT	85E	ARG $\Upsilon(2S) \rightarrow \text{conv.} \gamma X$	
163.8 ± 1.6 ± 2.7	NERNST	85	CBAL $\Upsilon(2S) \rightarrow \gamma X$	
158.0 ± 7 ± 1	HAAS	84	CLEO $\Upsilon(2S) \rightarrow \text{conv.} \gamma X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
149.4 ± 0.7 ± 5.0	KLOPFEN...	83	CUSB $\Upsilon(2S) \rightarrow \gamma X$	

$\chi_{b0}(1P)$ DECAY MODES

Mode		Fraction (Γ_i/Γ)	Confidence level	
Γ_1	$\gamma \Upsilon(1S)$	(1.76 ± 0.35) %		
Γ_2	$D^0 X$	< 10.4 %	90%	DESIG=1
Γ_3	$\pi^+ \pi^- K^+ K^- \pi^0$	< 1.6 $\times 10^{-4}$	90%	DESIG=2
Γ_4	$2\pi^+ \pi^- K^- K^0_S$	< 5 $\times 10^{-5}$	90%	DESIG=3
Γ_5	$2\pi^+ \pi^- K^- K^0_S 2\pi^0$	< 5 $\times 10^{-4}$	90%	DESIG=4
Γ_6	$2\pi^+ 2\pi^- 2\pi^0$	< 2.1 $\times 10^{-4}$	90%	DESIG=5
Γ_7	$2\pi^+ 2\pi^- K^+ K^-$	(1.1 ± 0.6) $\times 10^{-4}$		DESIG=6
Γ_8	$2\pi^+ 2\pi^- K^+ K^- \pi^0$	< 2.7 $\times 10^{-4}$	90%	DESIG=7
Γ_9	$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 5 $\times 10^{-4}$	90%	DESIG=8
Γ_{10}	$3\pi^+ 2\pi^- K^- K^0_S \pi^0$	< 1.6 $\times 10^{-4}$	90%	DESIG=9
Γ_{11}	$3\pi^+ 3\pi^-$	< 8 $\times 10^{-5}$	90%	DESIG=10
Γ_{12}	$3\pi^+ 3\pi^- 2\pi^0$	< 6 $\times 10^{-4}$	90%	DESIG=11
Γ_{13}	$3\pi^+ 3\pi^- K^+ K^-$	(2.4 ± 1.2) $\times 10^{-4}$		DESIG=12
Γ_{14}	$3\pi^+ 3\pi^- K^+ K^- \pi^0$	< 1.0 $\times 10^{-3}$	90%	DESIG=13
Γ_{15}	$4\pi^+ 4\pi^-$	< 8 $\times 10^{-5}$	90%	DESIG=14
Γ_{16}	$4\pi^+ 4\pi^- 2\pi^0$	< 2.1 $\times 10^{-3}$	90%	DESIG=15

NODE=M076215; NODE=M076

DESIG=1
 DESIG=2
 DESIG=3
 DESIG=4
 DESIG=5
 DESIG=6
 DESIG=7
 DESIG=8
 DESIG=9
 DESIG=10
 DESIG=11
 DESIG=12
 DESIG=13
 DESIG=14
 DESIG=15
 DESIG=16

NODE=M076M

NODE=M076M
 → UNCHECKED ←

NODE=M076DM

NODE=M076DM

$\chi_{b0}(1P)$ BRANCHING RATIOS

$\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$

VALUE (%)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
1.76±0.30±0.18		87	1,2 KORNICER	11 CLEO	$e^+ e^- \rightarrow \gamma\gamma\ell^+\ell^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 4.6	90	3 LEES	11J BABR	$\Upsilon(2S) \rightarrow X\gamma$		
< 6	90	WALK	86 CBAL	$\Upsilon(2S) \rightarrow \gamma\gamma\ell^+\ell^-$		
<11	90	PAUSS	83 CUSB	$\Upsilon(2S) \rightarrow \gamma\gamma\ell^+\ell^-$		

1 Assuming $B(\Upsilon(1S) \rightarrow \ell^+\ell^-) = (2.48 \pm 0.05)\%$.

2 KORNICER 11 reports $[\Gamma(\chi_{b0}(1P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] = (6.59 \pm 0.96 \pm 0.60) \times 10^{-4}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

3 LEES 11J quotes a central value of $\Gamma(\chi_{b0}(1P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))/\Gamma_{\text{total}} = (8.3 \pm 5.6^{+3.7}_{-2.6}) \times 10^{-4}$.

$\Gamma(D^0 X)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
<10.4 × 10⁻²	90	4,5 BRIERE	08 CLEO	$\Upsilon(2S) \rightarrow \gamma D^0 X$	

4 For $p_{D^0} > 2.5$ GeV/c.

5 The authors also present their result as $(5.6 \pm 3.6 \pm 0.5) \times 10^{-2}$.

$\Gamma(\pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
<1.6	90	6 ASNER	08A CLEO	$\Upsilon(2S) \rightarrow \gamma\pi^+\pi^-K^+K^-\pi^0$	
6 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow \pi^+\pi^-K^+K^-\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] < 6 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					

$\Gamma(2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
<0.5	90	7 ASNER	08A CLEO	$\Upsilon(2S) \rightarrow \gamma 2\pi^+\pi^-K^-K_S^0$	
7 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 2\pi^+\pi^-K^-K_S^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] < 2 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					

$\Gamma(2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
<5	90	8 ASNER	08A CLEO	$\Upsilon(2S) \rightarrow \gamma 2\pi^+\pi^-K^-2\pi^0$	
8 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 2\pi^+\pi^-K^-K_S^0 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] < 18 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					

$\Gamma(2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
<2.1	90	9 ASNER	08A CLEO	$\Upsilon(2S) \rightarrow \gamma 2\pi^+ 2\pi^- 2\pi^0$	
9 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] < 8 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					

$\Gamma(2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
1.1±0.6±0.1	7	10 ASNER	08A CLEO	$\Upsilon(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^-$	
10 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P))] = (4 \pm 2 \pm 1) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M076220

NODE=M076R1

NODE=M076R1

NODE=M076R1;LINKAGE=KA

NODE=M076R1;LINKAGE=KR

NODE=M076R1;LINKAGE=LE

NODE=M076R01

NODE=M076R01

NODE=M076R01;LINKAGE=BR

NODE=M076R01;LINKAGE=RI

NODE=M076R02

NODE=M076R02

NODE=M076R03

NODE=M076R03

NODE=M076R03

NODE=M076R03

NODE=M076R04

NODE=M076R04

NODE=M076R04;LINKAGE=AS

NODE=M076R05

NODE=M076R05

NODE=M076R05;LINKAGE=AS

NODE=M076R06

NODE=M076R06

NODE=M076R06;LINKAGE=AS

$\Gamma(2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$					Γ_8/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<2.7	90	11 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$	NODE=M076R07 NODE=M076R07
11 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 10 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R07;LINKAGE=AS
$\Gamma(2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_9/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<5	90	12 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	NODE=M076R08 NODE=M076R08
12 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 20 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R08;LINKAGE=AS
$\Gamma(3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}$					Γ_{10}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.6	90	13 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	NODE=M076R09 NODE=M076R09
13 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 6 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R09;LINKAGE=AS
$\Gamma(3\pi^+ 3\pi^-)/\Gamma_{\text{total}}$					Γ_{11}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.8	90	14 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^-$	NODE=M076R10 NODE=M076R10
14 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 3 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R10;LINKAGE=AS
$\Gamma(3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<6	90	15 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- 2\pi^0$	NODE=M076R11 NODE=M076R11
15 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 22 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R11;LINKAGE=AS
$\Gamma(3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}$					Γ_{13}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.4±1.2±0.2	9	16 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^-$	NODE=M076R12 NODE=M076R12
16 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] = (9 \pm 4 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = (3.8 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M076R12;LINKAGE=AS
$\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<10	90	17 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$	NODE=M076R13 NODE=M076R13
17 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 37 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R13;LINKAGE=AS
$\Gamma(4\pi^+ 4\pi^-)/\Gamma_{\text{total}}$					Γ_{15}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.8	90	18 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 4\pi^+ 4\pi^-$	NODE=M076R14 NODE=M076R14
18 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 4\pi^+ 4\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 3 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R14;LINKAGE=AS
$\Gamma(4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_{16}/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<21	90	19 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$	NODE=M076R15 NODE=M076R15
19 ASNER 08A reports $[\Gamma(\chi_{b0}(1P) \rightarrow 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P))] < 77 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.					NODE=M076R15;LINKAGE=AS

$\chi_{b0}(1P)$ CROSS-PARTICLE BRANCHING RATIOS

$$\Gamma(\chi_{b0}(1P) \rightarrow \gamma \Upsilon(1S)) / \Gamma_{\text{total}} \times \Gamma(\Upsilon(2S) \rightarrow \gamma \chi_{b0}(1P)) / \Gamma_{\text{total}}$$

$$\Gamma_1 / \Gamma \times \Gamma_{16}^{\Upsilon(2S)} / \Gamma^{\Upsilon(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.7 \times 10^{-3}$	90	20 LEES	11J BABR	$\Upsilon(2S) \rightarrow X\gamma$

20 LEES 11J quotes a central value of $\Gamma(\chi_{b0}(1P) \rightarrow \gamma \Upsilon(1S)) / \Gamma_{\text{total}} \times \Gamma(\Upsilon(2S) \rightarrow \gamma \chi_{b0}(1P)) / \Gamma_{\text{total}} = (8.3 \pm 5.6^{+3.7}_{-2.6}) \times 10^{-4}$ and derives a 90% CL upper limit of $\Gamma(\gamma \Upsilon(1S)) / \Gamma_{\text{total}} < 4.6\%$ using $B(\Upsilon(4S) \rightarrow \gamma \chi_{b0}(1P)) = (3.8 \pm 0.4)\%$.

$$B(\chi_{b0}(1P) \rightarrow \gamma \Upsilon(1S)) \times B(\Upsilon(2S) \rightarrow \gamma \chi_{b0}(1P)) \times B(\Upsilon(1S) \rightarrow \ell^+ \ell^-)$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.63 \pm 0.24 \pm 0.15$	87	KORNICER	11 CLEO	$e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$

$\chi_{b0}(1P)$ REFERENCES

KORNICER	11	PR D83 054003	M. Kornicer <i>et al.</i>	(CLEO Collab.)
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BRIERE	08	PR D78 092007	R.A. Briere <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
EDWARDS	99	PR D59 032003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
WALK	86	PR D34 2611	W.S. Walk <i>et al.</i>	(Crystal Ball Collab.)
ALBRECHT	85E	PL 160B 331	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
NERNST	85	PRL 54 2195	R. Nernst <i>et al.</i>	(Crystal Ball Collab.)
HAAS	84	PRL 52 799	J. Haas <i>et al.</i>	(CLEO Collab.)
KLOPFEN...	83	PRL 51 160	C. Klopfenstein <i>et al.</i>	(CUSB Collab.)
PAUSS	83	PL 130B 439	F. Pauss <i>et al.</i>	(MPIIM, COLU, CORN, LSU+)

$\chi_{b1}(1P)$

$$I^G(J^{PC}) = 0^+(1^{++})$$

J needs confirmation.

Observed in radiative decay of the $\Upsilon(2S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$. $J = 1$ from SKWARNICKI 87.

$\chi_{b1}(1P)$ MASS

VALUE (MeV)	DOCUMENT ID	COMMENT		
$9892.78 \pm 0.26 \pm 0.31$ OUR EVALUATION	From average γ energy below, using $\Upsilon(2S)$ mass = 10023.26 ± 0.31 MeV			

γ ENERGY IN $\Upsilon(2S)$ DECAY

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
129.63 ± 0.33 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.		
129.58 $\pm 0.09 \pm 0.29$	ARTUSO 05	CLEO	$\Upsilon(2S) \rightarrow \gamma X$
128.8 $\pm 0.4 \pm 0.6$	EDWARDS 99	CLE2	$\Upsilon(2S) \rightarrow \gamma \chi(1P)$
131.7 $\pm 0.9 \pm 1.3$	WALK 86	CBAL	$\Upsilon(2S) \rightarrow \gamma\gamma \ell^+ \ell^-$
131.7 $\pm 0.3 \pm 1.1$	ALBRECHT 85E	ARG	$\Upsilon(2S) \rightarrow \text{conv.} \gamma X$
130.6 $\pm 0.8 \pm 2.4$	NERNST 85	CBAL	$\Upsilon(2S) \rightarrow \gamma X$
129 $\pm 0.8 \pm 1$	HAAS 84	CLEO	$\Upsilon(2S) \rightarrow \text{conv.} \gamma X$
128.1 $\pm 0.4 \pm 3.0$	KLOPFEN... 83	CUSB	$\Upsilon(2S) \rightarrow \gamma X$
130.6 ± 3.0	PAUSS 83	CUSB	$\Upsilon(2S) \rightarrow \gamma\gamma \ell^+ \ell^-$

NODE=M076230

NODE=M076B02
NODE=M076B02

NODE=M076B02;LINKAGE=LE

NODE=M076B01
NODE=M076B01

NODE=M076

REFID=16769
REFID=53936
REFID=52574
REFID=52577
REFID=50454
REFID=46612
REFID=22290
REFID=22288
REFID=22289
REFID=22287
REFID=22285
REFID=22286

NODE=M077

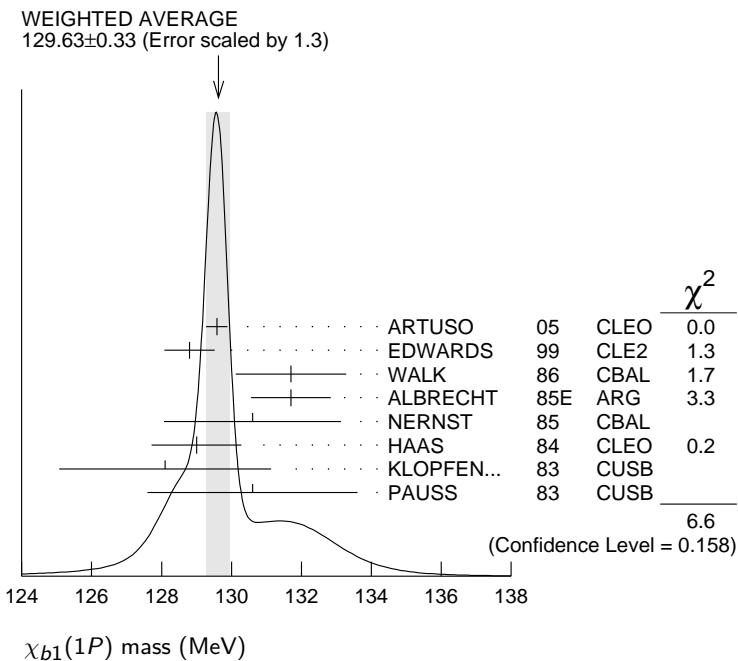
NODE=M077

NODE=M077M

NODE=M077M
→ UNCHECKED ←

NODE=M077DM

NODE=M077DM

 **$\chi_{b1}(1P)$ DECAY MODES**

NODE=M077215;NODE=M077

Mode	Fraction (Γ_i/Γ)	Confidence level	
$\Gamma_1 \gamma \Upsilon(1S)$	(33.9±2.2) %		DESIG=1
$\Gamma_2 D^0 X$	(12.6±2.2) %		DESIG=2
$\Gamma_3 \pi^+ \pi^- K^+ K^- \pi^0$	(2.0±0.6) $\times 10^{-4}$		DESIG=3
$\Gamma_4 2\pi^+ \pi^- K^- K_S^0$	(1.3±0.5) $\times 10^{-4}$		DESIG=4
$\Gamma_5 2\pi^+ \pi^- K^- K_S^0 2\pi^0$	< 6 $\times 10^{-4}$	90%	DESIG=5
$\Gamma_6 2\pi^+ 2\pi^- 2\pi^0$	(8.0±2.5) $\times 10^{-4}$		DESIG=6
$\Gamma_7 2\pi^+ 2\pi^- K^+ K^-$	(1.5±0.5) $\times 10^{-4}$		DESIG=7
$\Gamma_8 2\pi^+ 2\pi^- K^+ K^- \pi^0$	(3.5±1.2) $\times 10^{-4}$		DESIG=8
$\Gamma_9 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(8.6±3.2) $\times 10^{-4}$		DESIG=9
$\Gamma_{10} 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	(9.3±3.3) $\times 10^{-4}$		DESIG=10
$\Gamma_{11} 3\pi^+ 3\pi^-$	(1.9±0.6) $\times 10^{-4}$		DESIG=11
$\Gamma_{12} 3\pi^+ 3\pi^- 2\pi^0$	(1.7±0.5) $\times 10^{-3}$		DESIG=12
$\Gamma_{13} 3\pi^+ 3\pi^- K^+ K^-$	(2.6±0.8) $\times 10^{-4}$		DESIG=13
$\Gamma_{14} 3\pi^+ 3\pi^- K^+ K^- \pi^0$	(7.5±2.6) $\times 10^{-4}$		DESIG=14
$\Gamma_{15} 4\pi^+ 4\pi^-$	(2.6±0.9) $\times 10^{-4}$		DESIG=15
$\Gamma_{16} 4\pi^+ 4\pi^- 2\pi^0$	(1.4±0.6) $\times 10^{-3}$		DESIG=16

 $\chi_{b1}(1P)$ BRANCHING RATIOS

NODE=M077220

$\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$	Γ_1/Γ
0.339±0.022 OUR AVERAGE	
0.331±0.018±0.017	3222
0.350±0.023±0.018	13k
0.32 ± 0.06 ± 0.07	WALK
0.47 ± 0.18	KLOPFEN...

NODE=M077R1
NODE=M077R1

¹ Assuming $B(\Upsilon(1S) \rightarrow \ell^+ \ell^-) = (2.48 \pm 0.05)\%$.
² KORNICER 11 reports $[\Gamma(\chi_{b1}(1P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P))] = (22.8 \pm 0.4 \pm 1.2) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R1;LINKAGE=KA
NODE=M077R1;LINKAGE=KR

³ LEES 11J reports $[\Gamma(\chi_{b1}(1P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P))] = (24.1 \pm 0.6 \pm 1.5) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R1;LINKAGE=LE

$\Gamma(D^0 X)/\Gamma_{\text{total}}$					Γ_2/Γ
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	
12.6±1.9±1.1	2310	4 BRIERE	08 CLEO	$\gamma(2S) \rightarrow \gamma D^0 X$	

4 For $p_{D^0} > 2.5$ GeV/c.

$\Gamma(\pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.0±0.6±0.1	18	5 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^- \pi^0$	

5 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow \pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (14 \pm 3 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.3±0.5±0.1	11	6 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma 2\pi^+ \pi^- K^- K_S^0$	

6 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (9 \pm 3 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<6	90	7 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma 2\pi^+ \pi^- K^- 2\pi^0$	

7 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] < 42 \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = 6.9 \times 10^{-2}$.

$\Gamma(2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
8.0±2.4±0.4	46	8 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- 2\pi^0$	

8 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (55 \pm 9 \pm 14) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.5±0.5±0.1	18	9 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^-$	

9 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (10 \pm 3 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$					Γ_8/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.5±1.2±0.2	22	10 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$	

10 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (24 \pm 6 \pm 6) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_9/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
8.6±3.2±0.4	26	11 ASNER	08A CLEO	$\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	

11 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (59 \pm 14 \pm 17) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M077R01
NODE=M077R01

NODE=M077R01;LINKAGE=BR

NODE=M077R02
NODE=M077R02

NODE=M077R02;LINKAGE=AS

NODE=M077R03
NODE=M077R03

NODE=M077R03;LINKAGE=AS

NODE=M077R05
NODE=M077R05

NODE=M077R05;LINKAGE=AS

NODE=M077R07
NODE=M077R07

NODE=M077R07;LINKAGE=AS

NODE=M077R08
NODE=M077R08

NODE=M077R08;LINKAGE=AS

$\Gamma(3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}$					Γ_{10}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
9.3±3.3±0.5	21	12 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	NODE=M077R09 NODE=M077R09

12 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (64 \pm 16 \pm 16) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3\pi^+ 3\pi^-)/\Gamma_{\text{total}}$					Γ_{11}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
1.9±0.6±0.1	25	13 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^-$	NODE=M077R10 NODE=M077R10

13 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (13 \pm 3 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_{12}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
17±5±1	56	14 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- 2\pi^0$	NODE=M077R11 NODE=M077R11

14 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (119 \pm 18 \pm 32) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}$					Γ_{13}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.6±0.8±0.1	21	15 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^-$	NODE=M077R12 NODE=M077R12

15 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (18 \pm 4 \pm 4) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
7.5±2.6±0.4	28	16 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$	NODE=M077R13 NODE=M077R13

16 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (52 \pm 11 \pm 14) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(4\pi^+ 4\pi^-)/\Gamma_{\text{total}}$					Γ_{15}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
2.6±0.9±0.1	24	17 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 4\pi^+ 4\pi^-$	NODE=M077R14 NODE=M077R14

17 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 4\pi^+ 4\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (18 \pm 4 \pm 5) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_{16}/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
14±5±1	26	18 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$	NODE=M077R15 NODE=M077R15

18 ASNER 08A reports $[\Gamma(\chi_{b1}(1P) \rightarrow 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))] = (96 \pm 24 \pm 29) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P)) = (6.9 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\chi_{b1}(1P)$ Cross-Particle Branching Ratios

$$\Gamma(\chi_{b1}(1P) \rightarrow \gamma \Gamma(1S))/\Gamma_{\text{total}} \times \Gamma(\Gamma(2S) \rightarrow \gamma \chi_{b1}(1P))/\Gamma_{\text{total}} \quad \Gamma_1/\Gamma \times \frac{\Gamma(2S)}{\Gamma_{14}} / \Gamma(2S)$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
24.1±0.6±1.5	13k	LEES	11J BABR	$\Gamma(2S) \rightarrow X \gamma$	NODE=M077230

NODE=M077R09
NODE=M077R09

NODE=M077R09;LINKAGE=AS

NODE=M077R10
NODE=M077R10

NODE=M077R11;LINKAGE=AS

NODE=M077R12
NODE=M077R12

NODE=M077R12;LINKAGE=AS

NODE=M077R13
NODE=M077R13

NODE=M077R13;LINKAGE=AS

NODE=M077R14
NODE=M077R14

NODE=M077R14;LINKAGE=AS

NODE=M077R15
NODE=M077R15

NODE=M077R15;LINKAGE=AS

NODE=M077230

NODE=M077B03
NODE=M077B03

$B(\chi_{b1}(1P) \rightarrow \gamma \Upsilon(1S)) \times B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P)) \times B(\Upsilon(1S) \rightarrow \ell^+ \ell^-)$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$5.65 \pm 0.11 \pm 0.27$	3222	KORNICER	11	CLEO $e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$

NODE=M077B01
NODE=M077B01 **$B(\chi_{b1}(1P) \rightarrow \gamma \Upsilon(1S)) \times B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(1P)) \times B(\Upsilon(1S) \rightarrow \ell^+ \ell^-)$**

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.33 \pm 0.30 \pm 0.23$	50	KORNICER	11	CLEO $e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$

NODE=M077B02
NODE=M077B02 **$B(\chi_{b2}(1P) \rightarrow pX + \bar{p}X)/B(\chi_{b1}(1P) \rightarrow pX + \bar{p}X)$**

VALUE	DOCUMENT ID	TECN	COMMENT
$1.068 \pm 0.010 \pm 0.040$	BRIERE	07	CLEO $\Upsilon(2S) \rightarrow \gamma \chi_{bJ}(1P)$

NODE=M077R20
NODE=M077R20 **$B(\chi_{b0}(1P) \rightarrow pX + \bar{p}X)/B(\chi_{b1}(1P) \rightarrow pX + \bar{p}X)$**

VALUE	DOCUMENT ID	TECN	COMMENT
$1.11 \pm 0.15 \pm 0.20$	BRIERE	07	CLEO $\Upsilon(2S) \rightarrow \gamma \chi_{bJ}(1P)$

NODE=M077R21
NODE=M077R21 **$\chi_{b1}(1P)$ REFERENCES**

KORNICER	11	PR D83 054003	M. Kornicer <i>et al.</i>	(CLEO Collab.)
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BRIERE	08	PR D78 092007	R.A. Briere <i>et al.</i>	(CLEO Collab.)
BRIERE	07	PR D76 012005	R.A. Briere <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
EDWARDS	99	PR D59 032003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
SKWARNICKI	87	PRL 58 972	T. Skwarnicki <i>et al.</i>	(Crystal Ball Collab.)
WALK	86	PR D34 2611	W.S. Wall <i>et al.</i>	(Crystal Ball Collab.)
ALBRECHT	85E	PL 160B 331	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
NERNST	85	PRL 54 2195	R. Nernst <i>et al.</i>	(Crystal Ball Collab.)
HAAS	84	PRL 52 799	J. Haas <i>et al.</i>	(CLEO Collab.)
KLOPFEN... PAUSS	83	PRL 51 160 83 PL 130B 439	C. Klopfenstein <i>et al.</i> F. Pauss <i>et al.</i>	(CUSB Collab.) (MPIIM, COLU, CORN, LSU+)

NODE=M077

REFID=16769
REFID=53936
REFID=52574
REFID=52577
REFID=51887
REFID=50454
REFID=46612
REFID=40019
REFID=22290
REFID=22288
REFID=22289
REFID=22287
REFID=22285
REFID=22286 **$h_b(1P)$**

$I^G(J^{PC}) = ?^?(1^+-)$

Quantum numbers are quark model predictions, $C = -$ established by $\eta_b \gamma$ decay. **$h_b(1P)$ MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
9899.3 ± 1.0 OUR AVERAGE				
[9898.6 ± 1.4 MeV OUR 2012 AVERAGE]				
9899.1 $\pm 0.4 \pm 1.0$	70k	MIZUK	12	BELL $e^+ e^- \rightarrow \pi^+ \pi^-$ hadrons
9902 $\pm 4 \pm 2$	10.8k	LEES	11K	BABR $\Upsilon(3S) \rightarrow \eta_b \gamma \pi^0$

NODE=M204

• • • We do not use the following data for averages, fits, limits, etc. • • •
9898.2 $\pm 1.1 \pm 1.0$ 50.0k ¹ ADACHI 12 BELL $10.86 e^+ e^- \rightarrow \pi^+ \pi^-$ MM

1 Superseded by MIZUK 12.

NODE=M204

NODE=M204M

NODE=M204M
NEW **$h_b(1P)$ DECAY MODES**

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad \eta_b(1S) \gamma$	$(49 \pm 8) \%$

NODE=M204M;LINKAGE=AD

DESIG=1

NODE=M204215;NODE=M204

 $h_b(1P)$ BRANCHING RATIOS

$\Gamma(\eta_b(1S)\gamma)/\Gamma_{\text{total}}$	Γ_1/Γ
$49.2 \pm 5.7 \pm 5.6$ 24k MIZUK 12 BELL $e^+ e^- \rightarrow (\gamma)\pi^+ \pi^-$ hadrons	

NODE=M204225

NODE=M204R01
NODE=M204R01

seen 10.8k LEES 11K BABR $\Upsilon(3S) \rightarrow \eta_b \gamma \pi^0$

NODE=M204225

 $h_b(1P)$ REFERENCES

ADACHI 12 PRL 108 032001	I. Adachi <i>et al.</i>	(BELLE Collab.)
MIZUK 12 PRL 109 232002	R. Mizuk <i>et al.</i>	(BELLE Collab.)
LEES 11K PR D84 091101	J.P. Lees <i>et al.</i>	(BABAR Collab.)

NODE=M204
REFID=53962
REFID=54718
REFID=53937

$\chi_{b2}(1P)$

$I^G(JPC) = 0^+(2^{++})$
 J needs confirmation.

Observed in radiative decay of the $\Upsilon(2S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$. $J = 2$ from SKWARNICKI 87.

$\chi_{b2}(1P)$ MASS

VALUE (MeV)	DOCUMENT ID	COMMENT
9912.21 ± 0.26 ± 0.31 OUR EVALUATION		From average γ energy below, using $\Upsilon(2S)$ mass = 10023.26 ± 0.31 MeV

γ ENERGY IN $\Upsilon(2S)$ DECAY

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
110.44 ± 0.29 OUR AVERAGE			Error includes scale factor of 1.1.
110.58 ± 0.08 ± 0.30	ARTUSO 05	CLEO	$\Upsilon(2S) \rightarrow \gamma X$
110.8 ± 0.3 ± 0.6	EDWARDS 99	CLE2	$\Upsilon(2S) \rightarrow \gamma\chi(1P)$
107.0 ± 1.1 ± 1.3	WALK 86	CBAL	$\Upsilon(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
110.6 ± 0.3 ± 0.9	ALBRECHT 85E	ARG	$\Upsilon(2S) \rightarrow \text{conv.}\gamma X$
110.4 ± 0.8 ± 2.2	NERNST 85	CBAL	$\Upsilon(2S) \rightarrow \gamma X$
109.5 ± 0.7 ± 1.0	HAAS 84	CLEO	$\Upsilon(2S) \rightarrow \text{conv.}\gamma X$
108.2 ± 0.3 ± 2.0	KLOPFEN... 83	CUSB	$\Upsilon(2S) \rightarrow \gamma X$
108.8 ± 4.0	PAUSS 83	CUSB	$\Upsilon(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

$\chi_{b2}(1P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 \gamma \Upsilon(1S)$	(19.1 ± 1.2) %	
$\Gamma_2 D^0 X$	< 7.9 %	90%
$\Gamma_3 \pi^+ \pi^- K^+ K^- \pi^0$	(8 ± 5) × 10 ⁻⁵	
$\Gamma_4 2\pi^+ \pi^- K^- K_S^0$	< 1.0 × 10 ⁻⁴	90%
$\Gamma_5 2\pi^+ \pi^- K^- K_S^0 2\pi^0$	(5.3 ± 2.4) × 10 ⁻⁴	
$\Gamma_6 2\pi^+ 2\pi^- 2\pi^0$	(3.5 ± 1.4) × 10 ⁻⁴	
$\Gamma_7 2\pi^+ 2\pi^- K^+ K^-$	(1.1 ± 0.4) × 10 ⁻⁴	
$\Gamma_8 2\pi^+ 2\pi^- K^+ K^- \pi^0$	(2.1 ± 0.9) × 10 ⁻⁴	
$\Gamma_9 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(3.9 ± 1.8) × 10 ⁻⁴	
$\Gamma_{10} 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	< 5 × 10 ⁻⁴	90%
$\Gamma_{11} 3\pi^+ 3\pi^-$	(7.0 ± 3.1) × 10 ⁻⁵	
$\Gamma_{12} 3\pi^+ 3\pi^- 2\pi^0$	(1.0 ± 0.4) × 10 ⁻³	
$\Gamma_{13} 3\pi^+ 3\pi^- K^+ K^-$	< 8 × 10 ⁻⁵	90%
$\Gamma_{14} 3\pi^+ 3\pi^- K^+ K^- \pi^0$	(3.6 ± 1.5) × 10 ⁻⁴	
$\Gamma_{15} 4\pi^+ 4\pi^-$	(8 ± 4) × 10 ⁻⁵	
$\Gamma_{16} 4\pi^+ 4\pi^- 2\pi^0$	(1.8 ± 0.7) × 10 ⁻³	

$\chi_{b2}(1P)$ BRANCHING RATIOS

$\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$	EVTS	DOCUMENT ID	TECN	Γ_1/Γ
0.191 ± 0.012 OUR AVERAGE				
0.186 ± 0.011 ± 0.009	1770	1,2 KORNICER	11 CLEO	$e^+ e^- \rightarrow \gamma\gamma\ell^+\ell^-$
0.194 ± 0.014 ± 0.009	8k	3 LEES	11J BABR	$\Upsilon(2S) \rightarrow \gamma X$
0.27 ± 0.06 ± 0.06		WALK	86 CBAL	$\Upsilon(2S) \rightarrow \gamma\gamma\ell^+\ell^-$
0.20 ± 0.05		KLOPFEN...	83 CUSB	$\Upsilon(2S) \rightarrow \gamma\gamma\ell^+\ell^-$

1 Assuming $B(\Upsilon(1S) \rightarrow \ell^+\ell^-) = (2.48 \pm 0.05)\%$.

2 KORNICER 11 reports $[\Gamma(\chi_{b2}(1P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b2}(1P))] = (1.33 \pm 0.04 \pm 0.07) \times 10^{-2}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

3 LEES 11J reports $[\Gamma(\chi_{b2}(1P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \gamma\chi_{b2}(1P))] = (13.9 \pm 0.5^{+0.9}_{-1.1}) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \gamma\chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M078

NODE=M078

NODE=M078M

NODE=M078M
→ UNCHECKED ←

NODE=M078DM

NODE=M078DM

NODE=M078215; NODE=M078

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

DESIG=6

DESIG=7

DESIG=8

DESIG=9

DESIG=10

DESIG=11

DESIG=12

DESIG=13

DESIG=14

DESIG=15

DESIG=16

NODE=M078220

NODE=M078R1

NODE=M078R1

NODE=M078R1;LINKAGE=KA

NODE=M078R1;LINKAGE=KR

NODE=M078R1;LINKAGE=LE

$\Gamma(D^0 X)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
$<7.9 \times 10^{-2}$	90	4,5 BRIERE	08	CLEO $\gamma(2S) \rightarrow \gamma D^0 X$	

4 For $p_{D^0} > 2.5 \text{ GeV}/c$.5 The authors also present their result as $(5.4 \pm 1.9 \pm 0.5) \times 10^{-2}$. $\Gamma(\pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
$0.84 \pm 0.50 \pm 0.04$	8	6 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma \pi^+ \pi^- K^+ K^- \pi^0$	

6 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow \pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (6 \pm 3 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
<1.0	90	7 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma 2\pi^+ \pi^- K^- K_S^0$	

7 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] < 7 \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = 7.15 \times 10^{-2}$.

 $\Gamma(2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
$5.3 \pm 2.4 \pm 0.3$	11	8 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma 2\pi^+ \pi^- K^- 2\pi^0$	

8 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (38 \pm 14 \pm 10) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
$3.5 \pm 1.4 \pm 0.2$	19	9 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- 2\pi^0$	

9 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (25 \pm 8 \pm 6) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
$1.1 \pm 0.4 \pm 0.1$	14	10 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^-$	

10 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (8 \pm 2 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_8/Γ
$2.1 \pm 0.9 \pm 0.1$	13	11 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$	

11 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (15 \pm 5 \pm 4) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

 $\Gamma(2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_9/Γ
$3.9 \pm 1.8 \pm 0.2$	11	12 ASNER	08A	CLEO $\gamma(2S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	

12 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (28 \pm 11 \pm 7) \times 10^{-6}$ which we divide by our best value $B(\gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M078R01
NODE=M078R01NODE=M078R01;LINKAGE=BR
NODE=M078R01;LINKAGE=RINODE=M078R02
NODE=M078R02

NODE=M078R02;LINKAGE=AS

NODE=M078R03
NODE=M078R03

NODE=M078R03;LINKAGE=AS

NODE=M078R04
NODE=M078R04

NODE=M078R04;LINKAGE=AS

NODE=M078R05
NODE=M078R05

NODE=M078R05;LINKAGE=AS

NODE=M078R06
NODE=M078R06

NODE=M078R06;LINKAGE=AS

NODE=M078R07
NODE=M078R07

NODE=M078R07;LINKAGE=AS

NODE=M078R08
NODE=M078R08

NODE=M078R08;LINKAGE=AS

$\Gamma(3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<5	90	13 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$
13 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] < 36 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = 7.15 \times 10^{-2}$.				

 Γ_{10}/Γ NODE=M078R09
NODE=M078R09 $\Gamma(3\pi^+ 3\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.70±0.31±0.03	9	14 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^-$
14 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (5 \pm 2 \pm 1) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{11}/Γ NODE=M078R10
NODE=M078R10 $\Gamma(3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
10.2±3.6±0.5	34	15 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- 2\pi^0$
15 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (73 \pm 16 \pm 20) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{12}/Γ NODE=M078R11
NODE=M078R11 $\Gamma(3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<0.8	90	16 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^-$
16 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] < 6 \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = 7.15 \times 10^{-2}$.				

 Γ_{13}/Γ NODE=M078R12
NODE=M078R12 $\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
3.6±1.5±0.2	14	17 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$
17 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (26 \pm 8 \pm 7) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{14}/Γ NODE=M078R13
NODE=M078R13 $\Gamma(4\pi^+ 4\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.84±0.40±0.04	7	18 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 4\pi^+ 4\pi^-$
18 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 4\pi^+ 4\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (6 \pm 2 \pm 2) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{15}/Γ NODE=M078R14
NODE=M078R14 $\Gamma(4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
18±7±1	29	19 ASNER	08A CLEO	$\Gamma(2S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$
19 ASNER 08A reports $[\Gamma(\chi_{b2}(1P) \rightarrow 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))] = (132 \pm 31 \pm 40) \times 10^{-6}$ which we divide by our best value $B(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P)) = (7.15 \pm 0.35) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 Γ_{16}/Γ NODE=M078R15
NODE=M078R15 **$\chi_{b2}(1P)$ Cross-Particle Branching Ratios**

$\Gamma(\chi_{b2}(1P) \rightarrow \gamma \Gamma(1S))/\Gamma_{\text{total}} \times \Gamma(\Gamma(2S) \rightarrow \gamma \chi_{b2}(1P))/\Gamma_{\text{total}}$	$\Gamma_1/\Gamma \times \Gamma_{15}^{\Gamma(2S)}/\Gamma^{\Gamma(2S)}$
$13.9 \pm 0.5 \pm 0.9$	1

NODE=M078230
NODE=M078B03
NODE=M078B03

$B(\chi_{b2}(1P) \rightarrow \gamma \Upsilon(1S)) \times B(\Upsilon(2S) \rightarrow \gamma \chi_{b2}(1P)) \times B(\Upsilon(1S) \rightarrow \ell^+ \ell^-)$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.29 \pm 0.09 \pm 0.16$	1770	KORNICER	11	CLEO $e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$

 $B(\chi_{b2}(1P) \rightarrow \gamma \Upsilon(1S)) \times B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(1P)) \times B(\Upsilon(1S) \rightarrow \ell^+ \ell^-)$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$3.56 \pm 0.40 \pm 0.41$	126	KORNICER	11	CLEO $e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$

 $\chi_{b2}(1P)$ REFERENCES

KORNICER	11	PR D83 054003	M. Kornicer <i>et al.</i>	(CLEO Collab.)
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BRIERE	08	PR D78 092007	R.A. Briere <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PR D94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
EDWARDS	99	PR D59 032003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
SKWARNICKI	87	PRL 58 972	T. Skwarnicki <i>et al.</i>	(Crystal Ball Collab.) J
WALK	86	PR D34 2611	W.S. Walk <i>et al.</i>	(Crystal Ball Collab.)
ALBRECHT	85E	PL 160B 331	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
NERNST	85	PRL 54 2195	R. Nernst <i>et al.</i>	(Crystal Ball Collab.)
HAAS	84	PRL 52 799	J. Haas <i>et al.</i>	(CLEO Collab.)
KLOPFEN...	83	PRL 51 160	C. Klopfenstein <i>et al.</i>	(CUSB Collab.)
PAUSS	83	PL 130B 439	F. Pauss <i>et al.</i>	(MPIM, COLU, CORN, LSU+)

 $\eta_b(2S)$

$I^G(J^{PC}) = 0^+(0^- +)$

OMITTED FROM SUMMARY TABLE

Quantum numbers shown are quark-model predictions.

 $\eta_b(2S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$9999.0 \pm 3.5 \pm 2.8$	26k	1 MIZUK	12 BELL	$e^+ e^- \rightarrow \gamma\pi^+\pi^- +$ hadrons

• • • We do not use the following data for averages, fits, limits, etc. • • •

9974.6 \pm 2.3 \pm 2.1 11 \pm 4 2,3 DOBBS 12 $\Upsilon(2S) \rightarrow \gamma$ hadrons1 Assuming $\Gamma_{\eta_b(2S)} = 4.9$ MeV. Not independent of the corresponding mass difference measurement.

2 Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

3 Assuming $\Gamma_{\eta_b(2S)} = 5$ MeV. Not independent of the corresponding mass difference measurement. **$m_{\Upsilon(2S)} - m_{\eta_b(2S)}$**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
$24.3 \pm 3.5 \pm 2.8$	26k	4 MIZUK	12 BELL	$e^+ e^- \rightarrow \gamma\pi^+\pi^- +$ hadrons

• • • We do not use the following data for averages, fits, limits, etc. • • •

48.7 \pm 2.3 \pm 2.1 11 \pm 4 5,6 DOBBS 12 $\Upsilon(2S) \rightarrow \gamma$ hadrons4 Assuming $\Gamma_{\eta_b(2S)} = 4.9$ MeV. Not independent of the corresponding mass measurement.

5 Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

6 Assuming $\Gamma_{\eta_b(2S)} = 5$ MeV. Not independent of the corresponding mass measurement. **$\eta_b(2S)$ WIDTH**

VALUE (MeV)	CL%	DOCUMENT ID	TECN	COMMENT
<24	90	MIZUK	12 BELL	$e^+ e^- \rightarrow \gamma\pi^+\pi^-$ hadrons

 $\eta_b(2S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 hadrons	seen

NODE=M078B01
NODE=M078B01NODE=M078B02
NODE=M078B02

NODE=M078

REFID=16769
REFID=53936
REFID=52574
REFID=52577
REFID=50454
REFID=46612
REFID=40019
REFID=22290
REFID=22288
REFID=22289
REFID=22287
REFID=22285
REFID=22286

NODE=M200

NODE=M200

NODE=M200M

NODE=M200M

NODE=M200M;LINKAGE=MI

NODE=M200M;LINKAGE=DO

NODE=M200M;LINKAGE=NI

NODE=M200DM

NODE=M200DM

NODE=M200DM;LINKAGE=MI

NODE=M200DM;LINKAGE=DO

NODE=M200DM;LINKAGE=NI

NODE=M200W

NODE=M200W

NODE=M200215;NODE=M200

DESIG=1

$\eta_b(2S)$ BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
seen	26k	MIZUK	12	BELL $e^+ e^- \rightarrow \gamma \pi^+ \pi^-$ hadrons	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
seen	7 DOBBS	12		$\Upsilon(2S) \rightarrow \gamma$ hadrons	
7 Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.					

$\eta_b(2S)$ REFERENCES

DOBBS	12	PRL 109 082001	S. Dobbs <i>et al.</i>	
MIZUK	12	PRL 109 232002	R. Mizuk <i>et al.</i>	(BELLE Collab.)

$\Upsilon(2S)$

$$\Gamma^G(J^{PC}) = 0^-(1^{--})$$

$\Upsilon(2S)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
10023.26 ± 0.31 OUR AVERAGE				
[10.02326 ± 0.00031 GeV OUR 2012 AVERAGE]				
10023.5 ± 0.5	¹ ARTAMONOV 00	MD1	$e^+ e^- \rightarrow$ hadrons	
10023.1 ± 0.4	BARBER 84	REDE	$e^+ e^- \rightarrow$ hadrons	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$				
10023.6 ± 0.5	^{2,3} BARU	86B REDE	$e^+ e^- \rightarrow$ hadrons	
1 Reanalysis of BARU 86B using new electron mass (COHEN 87). 2 Reanalysis of ARTAMONOV 84. 3 Superseded by ARTAMONOV 00.				

$m_{\Upsilon(3S)} - m_{\Upsilon(2S)}$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
331.50 ± 0.02 ± 0.13	LEES	11C BABR	$e^+ e^- \rightarrow \pi^+ \pi^- X$	

$\Upsilon(2S)$ WIDTH

VALUE (keV)	DOCUMENT ID	COMMENT
31.98 ± 2.63 OUR EVALUATION	See the Note on "Width Determinations of the Υ States"	

$\Upsilon(2S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
$\Gamma_1 \Upsilon(1S) \pi^+ \pi^-$	(17.85 ± 0.26) %	
$\Gamma_2 \Upsilon(1S) \pi^0 \pi^0$	(8.6 ± 0.4) %	
$\Gamma_3 \tau^+ \tau^-$	(2.00 ± 0.21) %	
$\Gamma_4 \mu^+ \mu^-$	(1.93 ± 0.17) %	S=2.2
$\Gamma_5 e^+ e^-$	(1.91 ± 0.16) %	
$\Gamma_6 \Upsilon(1S) \pi^0$	< 4 $\times 10^{-5}$	CL=90%
$\Gamma_7 \Upsilon(1S) \eta$	(2.9 ± 0.4) $\times 10^{-4}$	S=2.0
$\Gamma_8 J/\psi(1S)$ anything	< 6 $\times 10^{-3}$	CL=90%
$\Gamma_9 d$ anything	(3.4 ± 0.6) $\times 10^{-5}$	
Γ_{10} hadrons	(94 ± 11) %	
$\Gamma_{11} g g g$	(58.8 ± 1.2) %	
$\Gamma_{12} \gamma g g$	(8.8 ± 1.1) %	
Γ_{13} Sum of 100 exclusive modes	(2.90 ± 0.30) $\times 10^{-3}$	

NODE=M200225

NODE=M200R01
NODE=M200R01

NODE=M200R01;LINKAGE=DO

NODE=M200

REFID=54288
REFID=54718

NODE=M052

NODE=M052M

NODE=M052M
NEWNODE=M052M;LINKAGE=AR
NODE=M052M;LINKAGE=C
NODE=M052M;LINKAGE=RZ

NODE=M052DM3

NODE=M052DM3

NODE=M052W

NODE=M052W
→ UNCHECKED ←

NODE=M052215;NODE=M052

DESIG=4

DESIG=5

DESIG=3

DESIG=1

DESIG=2

DESIG=10

DESIG=6

DESIG=20

DESIG=16

DESIG=101

DESIG=105

DESIG=106

DESIG=121

Radiative decays

Γ_{14}	$\gamma\chi_{b1}(1P)$	(6.9 \pm 0.4) %	NODE=M052;CLUMP=A
Γ_{15}	$\gamma\chi_{b2}(1P)$	(7.15 \pm 0.35) %	DESIG=8
Γ_{16}	$\gamma\chi_{b0}(1P)$	(3.8 \pm 0.4) %	DESIG=7
Γ_{17}	$\gamma f_0(1710)$	< 5.9 $\times 10^{-4}$	DESIG=9
Γ_{18}	$\gamma f'_2(1525)$	< 5.3 $\times 10^{-4}$	DESIG=13
Γ_{19}	$\gamma f_2(1270)$	< 2.41 $\times 10^{-4}$	DESIG=12
Γ_{20}	$\gamma f_J(2220)$		DESIG=11
Γ_{21}	$\gamma\eta_c(1S)$	< 2.7 $\times 10^{-5}$	DESIG=14
Γ_{22}	$\gamma\chi_{c0}$	< 1.0 $\times 10^{-4}$	DESIG=111
Γ_{23}	$\gamma\chi_{c1}$	< 3.6 $\times 10^{-6}$	DESIG=112
Γ_{24}	$\gamma\chi_{c2}$	< 1.5 $\times 10^{-5}$	DESIG=113
Γ_{25}	$\gamma X(3872) \rightarrow \pi^+ \pi^- J/\psi$	< 8 $\times 10^{-7}$	DESIG=114
Γ_{26}	$\gamma X(3872) \rightarrow \pi^+ \pi^- \pi^0 J/\psi$	< 2.4 $\times 10^{-6}$	DESIG=115
Γ_{27}	$\gamma X(3915) \rightarrow \omega J/\psi$	< 2.8 $\times 10^{-6}$	DESIG=116
Γ_{28}	$\gamma X(4140) \rightarrow \phi J/\psi$	< 1.2 $\times 10^{-6}$	DESIG=117
Γ_{29}	$\gamma X(4350) \rightarrow \phi J/\psi$	< 1.3 $\times 10^{-6}$	DESIG=118
Γ_{30}	$\gamma\eta_b(1S)$	(3.9 \pm 1.5) $\times 10^{-4}$	DESIG=119
Γ_{31}	$\gamma\eta_b(2S)$		DESIG=102
Γ_{32}	$\gamma X \rightarrow \gamma + \geq 4$ prongs	[a] < 1.95 $\times 10^{-4}$	DESIG=120
Γ_{33}	$\gamma A^0 \rightarrow \gamma$ hadrons	< 8 $\times 10^{-5}$	DESIG=103
Γ_{34}	$\gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	< 8.3 $\times 10^{-6}$	DESIG=108
			DESIG=123

Lepton Family number (*LF*) violating modes

Γ_{35}	$e^\pm \tau^\mp$	<i>LF</i>	< 3.2 $\times 10^{-6}$	CL=90%
Γ_{36}	$\mu^\pm \tau^\mp$	<i>LF</i>	< 3.3 $\times 10^{-6}$	CL=90%

[a] 1.5 GeV $< m_X <$ 5.0 GeV

NODE=M052;CLUMP=B

DESIG=107

DESIG=104

LINKAGE=C52

CONSTRAINED FIT INFORMATION

An overall fit to 3 branching ratios uses 13 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 11.8$ for 11 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

$$\begin{array}{ccc} x_7 & | & 2 \\ & \backslash & \\ & x_1 & \end{array}$$

 $\Gamma(2S) \Gamma(i) \Gamma(e^+ e^-) / \Gamma(\text{total})$

$\Gamma(\mu^+ \mu^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$	$\Gamma_4 \Gamma_5 / \Gamma$		
VALUE (eV)	DOCUMENT ID	TECN	COMMENT
6.5 \pm 1.5 \pm 1.0	KOBEL	92	CBAL $e^+ e^- \rightarrow \mu^+ \mu^-$

NODE=M052218

NODE=M052G1

NODE=M052G1

$\Gamma(\gamma(1S)\pi^+ \pi^-) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$	$\Gamma_4 \Gamma_5 / \Gamma$		
VALUE (eV)	EVTS	DOCUMENT ID	TECN
105.4 \pm 1.0 \pm 4.2	11.8K	1 AUBERT	08BP BABR $e^+ e^- \rightarrow \gamma \pi^+ \pi^- \ell^+ \ell^-$

NODE=M052G03

NODE=M052G03

1 Using $B(\gamma(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$ and $B(\gamma(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$.

$\Gamma(\text{hadrons}) \times \Gamma(e^+ e^-) / \Gamma_{\text{total}}$	$\Gamma_{10} \Gamma_5 / \Gamma$		
VALUE (keV)	DOCUMENT ID	TECN	COMMENT
0.577 \pm 0.009 OUR AVERAGE			
0.581 \pm 0.004 \pm 0.009	¹ ROSNER 06	CLEO	10.0 $e^+ e^- \rightarrow$ hadrons
0.552 \pm 0.031 \pm 0.017	¹ BARU 96	MD1	$e^+ e^- \rightarrow$ hadrons
0.54 \pm 0.04 \pm 0.02	¹ JAKUBOWSKI 88	CBAL	$e^+ e^- \rightarrow$ hadrons
0.58 \pm 0.03 \pm 0.04	² GILES 84B	CLEO	$e^+ e^- \rightarrow$ hadrons
0.60 \pm 0.12 \pm 0.07	² ALBRECHT 82	DASP	$e^+ e^- \rightarrow$ hadrons
0.54 \pm 0.07 $^{+0.09}_{-0.05}$	² NICZYPORUK 81C	LENA	$e^+ e^- \rightarrow$ hadrons
0.41 \pm 0.18	² BOCK 80	CNTR	$e^+ e^- \rightarrow$ hadrons

NODE=M052G2

NODE=M052G2

NODE=M052G03;LINKAGE=AU

¹ Radiative corrections evaluated following KURAEV 85.² Radiative corrections reevaluated by BUCHMUELLER 88 following KURAEV 85. **$\Upsilon(2S)$ PARTIAL WIDTHS**

$$\Gamma(e^+ e^-)$$

VALUE (keV)

0.612±0.011 OUR EVALUATION

DOCUMENT ID

$$\Gamma_5$$

$$\Gamma(\Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$$

$$\Gamma_1/\Gamma$$

Abbreviation MM in the COMMENT field below stands for missing mass.

VALUE (units 10^{-2})**17.85±0.26 OUR FIT****17.92±0.26 OUR AVERAGE**

EVTS

DOCUMENT ID

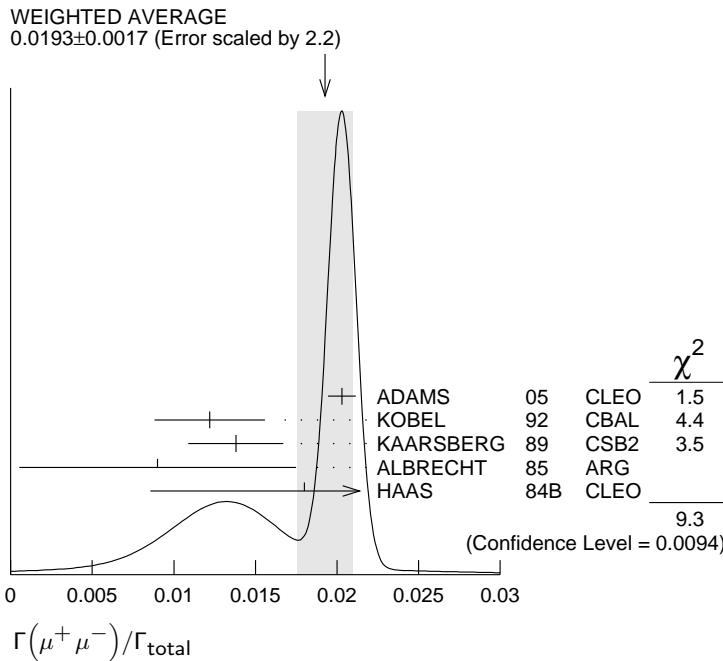
TECN

COMMENT

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
0.0193±0.0017 OUR AVERAGE					Error includes scale factor of 2.2. See the ideogram below.	
0.0203±0.0003±0.0008		120k	ADAMS	05	CLEO $e^+e^- \rightarrow \mu^+\mu^-$	
0.0122±0.0028±0.0019			1 KOBEL	92	CBAL $e^+e^- \rightarrow \mu^+\mu^-$	
0.0138±0.0025±0.0015			KAARSBERG	89	CSB2 $e^+e^- \rightarrow \mu^+\mu^-$	
0.009 ± 0.006 ± 0.006			2 ALBRECHT	85	ARG $e^+e^- \rightarrow \mu^+\mu^-$	
0.018 ± 0.008 ± 0.005			HAAS	84B	CLEO $e^+e^- \rightarrow \mu^+\mu^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.038		90	NICZYPORUK	81C	LENA $e^+e^- \rightarrow \mu^+\mu^-$	

1 Taking into account interference between the resonance and continuum.

2 Re-evaluated using $B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = 0.026$.NODE=M052R1
NODE=M052R1 $\Gamma(\tau^+\tau^-)/\Gamma(\mu^+\mu^-)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ_4
1.04±0.04±0.05	22k	BESSON	07	CLEO $e^+e^- \rightarrow \Upsilon(2S)$	

NODE=M052R17
NODE=M052R17 $\Gamma(\Upsilon(1S)\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ
• • • We do not use the following data for averages, fits, limits, etc. • • •					

NODE=M052R10
NODE=M052R101 TAMPONI 13 reports $[\Gamma(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^0)/\Gamma_{\text{total}}] / [B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-)]$ < 2.3×10^{-4} which we multiply by our best value $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-) = 17.85 \times 10^{-2}$.2 Authors assume $B(\Upsilon(1S) \rightarrow e^+e^-) + B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = 4.96\%$.

NODE=M052R10;LINKAGE=TA

 $\Gamma(\Upsilon(1S)\pi^0)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_6/Γ_1
<2.3	90	TAMPONI	13	BELL $e^+e^- \rightarrow \Upsilon(1S)\pi^0$	

NODE=M052R09
NODE=M052R09 $\Gamma(\Upsilon(1S)\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_7/Γ
2.9 ± 0.4 OUR FIT					Error includes scale factor of 2.0.	
2.9 ± 0.4 OUR AVERAGE					Error includes scale factor of 1.9. See the ideogram below. [(2.34 ± 0.31) × 10 $^{-4}$ OUR 2012 AVERAGE]	

NODE=M052R6
NODE=M052R6

• • • We use the following data for averages but not for fits. • • •

3.55±0.32±0.05 241 3 TAMPONI 13 BELL $e^+e^- \rightarrow \Upsilon(1S)\eta$

NEW

NOTFITTED

• • • We do not use the following data for averages, fits, limits, etc. • • •

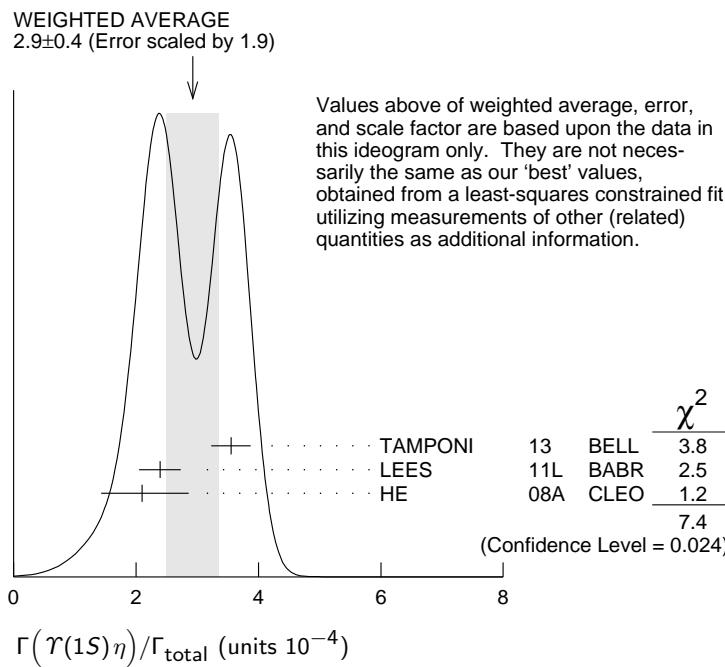
< 9	90	1,4 AUBERT	08BP BABR	$e^+ e^- \rightarrow \gamma\pi^+\pi^-\pi^0\ell^+\ell^-$	
< 28	90	ALEXANDER98	CLE2	$e^+ e^- \rightarrow \ell^+\ell^-\eta$	
< 50	90	ALBRECHT	87	$e^+ e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$ MM	
< 70	90	LURZ	87	$e^+ e^- \rightarrow \ell^+\ell^-(\gamma\gamma, 3\pi^0)$	
< 100	90	BESSON	84	$e^+ e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$ MM	
< 20	90	FONSECA	84	$e^+ e^- \rightarrow \ell^+\ell^-(\gamma\gamma, \pi^+\pi^-\pi^0)$	

¹ Using $B(\Upsilon(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$ and $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$.

² Authors assume $B(\Upsilon(1S) \rightarrow e^+ e^-) + B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = 4.96\%$.

³ TAMPONI 13 reports $[\Gamma(\Upsilon(2S) \rightarrow \Upsilon(1S)\eta)/\Gamma_{\text{total}}] / [B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-)] = (1.99 \pm 0.14 \pm 0.11) \times 10^{-3}$ which we multiply by our best value $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-) = (17.85 \pm 0.26) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁴ Using $\Gamma_{ee}(\Upsilon(2S)) = 0.612 \pm 0.011$ keV.



$\Gamma(\Upsilon(1S)\eta)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$

VALUE (units 10^{-3}) CL% EVTS DOCUMENT ID TECN COMMENT

1.64±0.25 OUR FIT Error includes scale factor of 2.0.

1.99±0.14±0.11 241 TAMPONI 13 BELL $e^+ e^- \rightarrow \Upsilon(1S)\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$1.35 \pm 0.17 \pm 0.08$ ¹ LEES 11L BABR $\Upsilon(2S) \rightarrow (\pi^+\pi^-)(\gamma\gamma)\mu^+\mu^-$
 < 5.2 90 ² AUBERT 08BP BABR $e^+ e^- \rightarrow \gamma\pi^+\pi^-(\pi^0)\ell^+\ell^-$

¹ Not independent of other values reported by LEES 11L.

² Not independent of other values reported by AUBERT 08BP.

Γ_7/Γ_1

NODE=M052R22
NODE=M052R22

$\Gamma(\Upsilon(1S)\pi^0)/\Gamma(\Upsilon(1S)\eta)$

VALUE CL% DOCUMENT ID TECN COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 0.13 90 TAMPONI 13 BELL $e^+ e^- \rightarrow \Upsilon(1S)\pi^0$

Γ_6/Γ_7

NODE=M052R23
NODE=M052R23

$\Gamma(J/\psi(1S) \text{ anything})/\Gamma_{\text{total}}$

VALUE CL% DOCUMENT ID TECN COMMENT

< 0.006 90 MASCHMANN 90 CBAL $e^+ e^- \rightarrow \text{hadrons}$

Γ_8/Γ

NODE=M052R16
NODE=M052R16

$\Gamma(\bar{d} \text{ anything})/\Gamma_{\text{total}}$

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

3.37±0.50±0.25 58 ASNER 07 CLEO $e^+ e^- \rightarrow \bar{d}X$

Γ_9/Γ

NODE=M052R18
NODE=M052R18

$\Gamma(ggg)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{11}/Γ
58.8±1.2	6M	1 BESSON	06A CLEO	$\gamma(2S) \rightarrow \text{hadrons}$	

¹ Calculated using the value $\Gamma(\gamma gg)/\Gamma(ggg) = (3.18 \pm 0.04 \pm 0.22 \pm 0.41)\%$ from BESSON 06A and PDG 08 values of $B(\pi^+ \pi^- \gamma(1S)) = (18.1 \pm 0.4)\%$, $B(\pi^0 \pi^0 \gamma(1S)) = (8.6 \pm 0.4)\%$, $B(\mu^+ \mu^-) = (1.93 \pm 0.17)\%$, and $R_{\text{hadrons}} = 3.51$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.

 $\Gamma(\gamma gg)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
8.79±1.05	100k	1 BESSON	06A CLEO	$\gamma(2S) \rightarrow \gamma + \text{hadrons}$	

¹ Calculated using BESSON 06A values of $\Gamma(\gamma gg)/\Gamma(ggg) = (3.18 \pm 0.04 \pm 0.22 \pm 0.41)\%$ and $\Gamma(ggg)/\Gamma_{\text{total}}$. The statistical error is negligible and the systematic error is partially correlated with that of $\Gamma(ggg)/\Gamma_{\text{total}}$ measurement of BESSON 06A.

 $\Gamma(\text{Sum of 100 exclusive modes})/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
0.29±0.03	1,2 DOBBS	12A		$\gamma(2S) \rightarrow \text{hadrons}$	

¹ DOBBS 12A presents individual exclusive branching fractions or upper limits for 100 modes of four to ten pions, kaons, or protons.

² Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.

 $\Gamma(\gamma gg)/\Gamma(ggg)$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ_{11}
3.18±0.04±0.47	6M	BESSON	06A CLEO	$\gamma(2S) \rightarrow (\gamma+) \text{hadrons}$	

 $\Gamma(\gamma \chi_{b1}(1P))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{14}/Γ
0.069 ± 0.004 OUR AVERAGE					
0.0693±0.0012±0.0041	407k	ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$	
0.069 ± 0.005 ± 0.009		EDWARDS	99 CLE2	$\gamma(2S) \rightarrow \gamma \chi(1P)$	
0.091 ± 0.018 ± 0.022		ALBRECHT	85E ARG	$e^+ e^- \rightarrow \gamma \text{conv. } X$	
0.065 ± 0.007 ± 0.012		NERNST	85 CBAL	$e^+ e^- \rightarrow \gamma X$	
0.080 ± 0.017 ± 0.016		HAAS	84 CLEO	$e^+ e^- \rightarrow \gamma \text{conv. } X$	
0.059 ± 0.014		KLOPFEN...	83 CUSB	$e^+ e^- \rightarrow \gamma X$	

 $\Gamma(\gamma \chi_{b2}(1P))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{15}/Γ
0.0715±0.0035 OUR AVERAGE					
0.0724±0.0011±0.0040	410k	ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$	
0.074 ± 0.005 ± 0.008		EDWARDS	99 CLE2	$\gamma(2S) \rightarrow \gamma \chi(1P)$	
0.098 ± 0.021 ± 0.024		ALBRECHT	85E ARG	$e^+ e^- \rightarrow \gamma \text{conv. } X$	
0.058 ± 0.007 ± 0.010		NERNST	85 CBAL	$e^+ e^- \rightarrow \gamma X$	
0.102 ± 0.018 ± 0.021		HAAS	84 CLEO	$e^+ e^- \rightarrow \gamma \text{conv. } X$	
0.061 ± 0.014		KLOPFEN...	83 CUSB	$e^+ e^- \rightarrow \gamma X$	

 $\Gamma(\gamma \chi_{b0}(1P))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{16}/Γ
0.038 ± 0.004 OUR AVERAGE					
0.0375±0.0012±0.0047	198k	ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$	
0.034 ± 0.005 ± 0.006		EDWARDS	99 CLE2	$\gamma(2S) \rightarrow \gamma \chi(1P)$	
0.064 ± 0.014 ± 0.016		ALBRECHT	85E ARG	$e^+ e^- \rightarrow \gamma \text{conv. } X$	
0.036 ± 0.008 ± 0.009		NERNST	85 CBAL	$e^+ e^- \rightarrow \gamma X$	
0.044 ± 0.023 ± 0.009		HAAS	84 CLEO	$e^+ e^- \rightarrow \gamma \text{conv. } X$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.035 ± 0.014	KLOPFEN...	83 CUSB	$e^+ e^- \rightarrow \gamma X$
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 $\Gamma(\gamma f_0(1710))/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{17}/Γ
<59	90	1 ALBRECHT	89 ARG	$\gamma(2S) \rightarrow \gamma K^+ K^-$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 5.9	90	2 ALBRECHT	89 ARG	$\gamma(2S) \rightarrow \gamma \pi^+ \pi^-$
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¹ Re-evaluated assuming $B(f_0(1710) \rightarrow K^+ K^-) = 0.19$.

² Includes unknown branching ratio of $f_0(1710) \rightarrow \pi^+ \pi^-$.

NODE=M052R01
NODE=M052R01

NODE=M052R01;LINKAGE=BE

NODE=M052R02
NODE=M052R02

NODE=M052R02;LINKAGE=BE

NODE=M052R08
NODE=M052R08

NODE=M052R08;LINKAGE=DO

NODE=M052R08;LINKAGE=NC

NODE=M052R03
NODE=M052R03

NODE=M052R8
NODE=M052R8

NODE=M052R7
NODE=M052R7

NODE=M052R9
NODE=M052R9

NODE=M052R13
NODE=M052R13

OCCUR=2

NODE=M052R13;LINKAGE=M

NODE=M052R13;LINKAGE=N

$\Gamma(\gamma f'_2(1525))/\Gamma_{\text{total}}$				Γ_{18}/Γ	NODE=M052R12 NODE=M052R12
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<53 90 ¹ ALBRECHT 89 ARG $\gamma(2S) \rightarrow \gamma K^+ K^-$					
1 Re-evaluated assuming $B(f'_2(1525) \rightarrow K\bar{K}) = 0.71$.					
$\Gamma(\gamma f_2(1270))/\Gamma_{\text{total}}$				Γ_{19}/Γ	NODE=M052R11 NODE=M052R11
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<24.1 90		¹ ALBRECHT 89 ARG		$\gamma(2S) \rightarrow \gamma\pi^+\pi^-$	
1 Using $B(f_2(1270) \rightarrow \pi\pi) = 0.84$.					
$\Gamma(\gamma f_J(2220))/\Gamma_{\text{total}}$				Γ_{20}/Γ	NODE=M052R14 NODE=M052R14
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<6.8	90	¹ ALBRECHT 89 ARG		$\gamma(2S) \rightarrow \gamma K^+ K^-$	
1 Includes unknown branching ratio of $f_J(2220) \rightarrow K^+ K^-$.					
$\Gamma(\gamma\eta_c(1S))/\Gamma_{\text{total}}$				Γ_{21}/Γ	NODE=M052R31 NODE=M052R31
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2.7 × 10⁻⁵	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma\chi_{c0})/\Gamma_{\text{total}}$				Γ_{22}/Γ	NODE=M052R32 NODE=M052R32
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.0 × 10⁻⁴	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma\chi_{c1})/\Gamma_{\text{total}}$				Γ_{23}/Γ	NODE=M052R33 NODE=M052R33
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<3.6 × 10⁻⁶	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma\chi_{c2})/\Gamma_{\text{total}}$				Γ_{24}/Γ	NODE=M052R34 NODE=M052R34
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.5 × 10⁻⁵	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma X(3872) \rightarrow \pi^+ \pi^- J/\psi)/\Gamma_{\text{total}}$				Γ_{25}/Γ	NODE=M052R35 NODE=M052R35
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.8 × 10⁻⁶	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma X(3872) \rightarrow \pi^+ \pi^- \pi^0 J/\psi)/\Gamma_{\text{total}}$				Γ_{26}/Γ	NODE=M052R36 NODE=M052R36
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2.4 × 10⁻⁶	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma X(3915) \rightarrow \omega J/\psi)/\Gamma_{\text{total}}$				Γ_{27}/Γ	NODE=M052R37 NODE=M052R37
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2.8 × 10⁻⁶	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma X(4140) \rightarrow \phi J/\psi)/\Gamma_{\text{total}}$				Γ_{28}/Γ	NODE=M052R38 NODE=M052R38
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.2 × 10⁻⁶	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma X(4350) \rightarrow \phi J/\psi)/\Gamma_{\text{total}}$				Γ_{29}/Γ	NODE=M052R39 NODE=M052R39
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.3 × 10⁻⁶	90	WANG 11B BELL		$\gamma(2S) \rightarrow \gamma X$	
$\Gamma(\gamma\eta_b(1S))/\Gamma_{\text{total}}$				Γ_{30}/Γ	NODE=M052R15 NODE=M052R15
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.9 ± 1.1^{+1.1}_{-0.9}		13 ± 5k	¹ AUBERT	09AQ BABR	$\gamma(2S) \rightarrow \gamma X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<21	90	LEES	11J	BABR	$\gamma(2S) \rightarrow X\gamma$
< 8.4	90	¹ BONVICINI	10	CLEO	$\gamma(2S) \rightarrow \gamma X$
< 5.1	90	² ARTUSO	05	CLEO	$e^+ e^- \rightarrow \gamma X$
1 Assuming $\Gamma_{\eta_b}(1S) = 10$ MeV.					
2 Superseded by BONVICINI 10.					

$\Gamma(\gamma\eta_b(2S))/\Gamma_{\text{total}}$					Γ_{31}/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
seen	11 ± 4	1 DOBBS	12	$\gamma(2S) \rightarrow \gamma$ hadrons	
1 Obtained by analyzing CLEO III data but not authored by the CLEO Collaboration.					
$\Gamma(\gamma X \rightarrow \gamma + \geq 4 \text{ prongs})/\Gamma_{\text{total}}$					Γ_{32}/Γ
(1.5 GeV < m_X < 5.0 GeV)					
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.95	95	ROSNER	07A	CLEO	$e^+ e^- \rightarrow \gamma X$
$\Gamma(\gamma A^0 \rightarrow \gamma \text{hadrons})/\Gamma_{\text{total}}$					Γ_{33}/Γ
(0.3 GeV < m_{A^0} < 7 GeV)					
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
$<8 \times 10^{-5}$	90	1 LEES	11H	BABR	$\gamma(2S) \rightarrow \gamma$ hadrons
1 For a narrow scalar or pseudoscalar A^0 , excluding known resonances, with mass in the range 0.3–7 GeV. Measured 90% CL limits as a function of m_{A^0} range from 1×10^{-6} to 8×10^{-5} .					
$\Gamma(\gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-)/\Gamma_{\text{total}}$					Γ_{34}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<8.3	90	1 AUBERT	09Z	BABR	$e^+ e^- \rightarrow \gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$
1 For a narrow scalar or pseudoscalar a_1^0 with mass in the range 212–9300 MeV, excluding J/ψ and $\psi(2S)$. Measured 90% CL limits as a function of $m_{a_1^0}$ range from $0.26\text{--}8.3 \times 10^{-6}$.					
LEPTON FAMILY NUMBER (LF) VIOLATING MODES					
$\Gamma(e^\pm \tau^\mp)/\Gamma_{\text{total}}$					Γ_{35}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<3.2	90	LEES	10B	BABR	$e^+ e^- \rightarrow e^\pm \tau^\mp$
$\Gamma(\mu^\pm \tau^\mp)/\Gamma_{\text{total}}$					Γ_{36}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
< 3.3	90	LEES	10B	BABR	$e^+ e^- \rightarrow \mu^\pm \tau^\mp$
$\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$					
<14.4	95	LOVE	08A	CLEO	$e^+ e^- \rightarrow \mu^\pm \tau^\mp$

$\gamma(2S)$ Cross-Particle Branching Ratios

$B(\gamma(2S) \rightarrow \pi^+ \pi^-) \times B(\gamma(3S) \rightarrow \gamma(2S)X)$				
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.78 \pm 0.02 \pm 0.11$	906k	LEES	11C	BABR
				$e^+ e^- \rightarrow \pi^+ \pi^- X$

$\gamma(2S)$ REFERENCES

TAMPONI	13	PR D87 011104	U. Tamponi <i>et al.</i>	(BELLE Collab.)
DOBBS	12	PRL 109 082001	S. Dobbs <i>et al.</i>	
DOBBS	12A	PR D86 052003	S. Dobbs <i>et al.</i>	
LEES	11C	PR D84 011104	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	11H	PRL 107 221803	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	11L	PR D84 092003	J.P. Lees <i>et al.</i>	(BABAR Collab.)
WANG	11B	PR D84 071107	X.L. Wang <i>et al.</i>	(BELLE Collab.)
BONVICINI	10	PR D81 031104	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
LEES	10B	PRL 104 151802	J.P. Lees <i>et al.</i>	(BABAR Collab.)
AUBERT	09AQ	PRL 103 161801	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	09Z	PRL 103 081803	B. Aubert <i>et al.</i>	(BABAR Collab.)
BHARI	09	PR D79 011103	S.R. Bhari <i>et al.</i>	(CLEO Collab.)
AUBERT	08BP	PR D78 112002	B. Aubert <i>et al.</i>	(BABAR Collab.)
HE	08A	PRL 101 192001	Q. He <i>et al.</i>	(CLEO Collab.)
LOVE	08A	PR D101 201601	W. Love <i>et al.</i>	(CLEO Collab.)
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
ASNER	07	PR D75 012009	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BESSON	07	PR D98 052002	D. Besson <i>et al.</i>	(CLEO Collab.)
ROSNER	07A	PR D76 117102	J.L. Rosner <i>et al.</i>	(CLEO Collab.)
BESSON	06A	PR D74 012003	D. Besson <i>et al.</i>	(CLEO Collab.)
ROSNER	06	PRL 96 092003	J.L. Rosner <i>et al.</i>	(CLEO Collab.)
ADAMS	05	PRL 94 012001	G.S. Adams <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
ARTAMONOV	00	PL B474 427	A.S. Artamonov <i>et al.</i>	(CLEO Collab.)
EDWARDS	99	PR D59 032003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)

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ALEXANDER	98	PR D58 052004	J.P. Alexander <i>et al.</i>	(CLEO Collab.)	REFID=46329
BARU	96	PRPL 267 71	S.E. Baru <i>et al.</i>	(NOVO)	REFID=44651
KOBEL	92	ZPHY C53 193	M. Kobel <i>et al.</i>	(Crystal Ball Collab.)	REFID=41861
MASCHMANN	90	ZPHY C46 555	W.S. Maschmann <i>et al.</i>	(Crystal Ball Collab.)	REFID=41224
ALBRECHT	89	ZPHY C42 349	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=40731
KAARSBERG	89	PRC 62 2077	T.M. Kaarsberg <i>et al.</i>	(CUSB Collab.)	REFID=40733
BUCHMUELLER	88	HE e ⁺ e ⁻ Physics 412	W. Buchmuller, S. Cooper Editors: A. Ali and P. Soeding, World Scientific, Singapore	(HANN, DESY, MIT)	REFID=40034
JAKUBOWSKI	88	ZPHY C40 49	Z. Jakubowski <i>et al.</i>	(Crystal Ball Collab.)	REFID=40742
ALBRECHT	87	ZPHY C35 283	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=40016
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)	REFID=11616
LURZ	87	ZPHY C36 383	B. Lurz <i>et al.</i>	(Crystal Ball Collab.)	REFID=40021
BARU	86B	ZPHY C32 622 (erratum)	S.E. Baru <i>et al.</i>	(NOVO)	REFID=22338
ALBRECHT	85	ZPHY C28 45	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=22334
ALBRECHT	85E	PL 160B 331	H. Albrecht <i>et al.</i>	(ARGUS Collab.)	REFID=22288
GELPHMAN	85	PR D32 2893	D. Gelfphman <i>et al.</i>	(Crystal Ball Collab.)	REFID=22336
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)	REFID=40033
NERNST	85	PRL 54 2195	R. Nernst <i>et al.</i>	(Crystal Ball Collab.)	REFID=22289
ARTAMONOV	84	PL 137B 272	A.S. Artamonov <i>et al.</i>	(NOVO)	REFID=22278
BARBER	84	PL 135B 498	D.P. Barber <i>et al.</i>	(DESY, ARGUS Collab.+)	REFID=22327
BESSON	84	PR D30 1433	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=22279
FONSECA	84	NP B242 31	V. Fonseca <i>et al.</i>	(CUSB Collab.)	REFID=22329
GILES	84B	PR D29 1285	R. Giles <i>et al.</i>	(CLEO Collab.)	REFID=22280
HAAS	84	PRL 52 799	J. Haas <i>et al.</i>	(CLEO Collab.)	REFID=22287
HAAS	84B	PR D30 1996	J. Haas <i>et al.</i>	(CLEO Collab.)	REFID=22332
KLOPFEN	83	PRL 51 160	C. Klopfenstein <i>et al.</i>	(CUSB Collab.)	REFID=22285
ALBRECHT	82	PL 116B 383	H. Albrecht <i>et al.</i>	(DESY, DORT, HEIDH+)	REFID=22270
NICZYPORUK	81B	PL 100B 95	B. Niczyporuk <i>et al.</i>	(LENA Collab.)	REFID=22319
NICZYPORUK	81C	PL 99B 169	B. Niczyporuk <i>et al.</i>	(LENA Collab.)	REFID=22318
BOCK	80	ZPHY C6 125	P. Bock <i>et al.</i>	(HEIDP, MPIM, DESY, HAMB)	REFID=22264

 $\gamma(1D)$

$I^G(J^{PC}) = 0^-(2^{--})$

First observed by BONVICINI 04 in the decay to $\gamma\gamma \gamma(1S)$ and confirmed by DEL-AMO-SANCHEZ 10R in the decay to $\pi^+\pi^- \gamma(1S)$. Data consistent with $J^P = 2^-$. The states with $J = 1$ and 3 also possibly seen, but need confirmation.

 $\gamma(1D)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
10163.7±1.4 OUR AVERAGE		Error includes scale factor of 1.7.		
10164.5±0.8±0.5		DEL-AMO-SA..10R	BABR	$\gamma(3S) \rightarrow \gamma\gamma\pi^+\pi^-\ell^+\ell^-$
10161.1±0.6±1.6	38	BONVICINI 04	CLE3	$\gamma(3S) \rightarrow 4\gamma\ell^+\ell^-$

 $\gamma(1D)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \gamma\gamma \gamma(1S)$	seen
$\Gamma_2 \gamma\chi_{bJ}(1P)$	seen
$\Gamma_3 \eta \gamma(1S)$	not seen
$\Gamma_4 \pi^+\pi^- \gamma(1S)$	$(6.6 \pm 1.6) \times 10^{-3}$

 $\gamma(1D)$ BRANCHING RATIOS

$\Gamma(\eta \gamma(1S))/\Gamma(\gamma\gamma \gamma(1S))$	Γ_3/Γ_1
VALUE CL%	DOCUMENT ID TECN COMMENT

<0.25	90	BONVICINI 04	CLE3	$\gamma(3S) \rightarrow 4\gamma\ell^+\ell^-$
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$\Gamma(\pi^+\pi^- \gamma(1S))/\Gamma_{\text{total}}$	Γ_4/Γ_1
VALUE (units 10^{-2})	DOCUMENT ID TECN COMMENT

0.66 ^{+0.15} _{-0.14} ^{±0.06}	¹ DEL-AMO-SA..10R BABR	$\gamma(3S) \rightarrow \gamma\gamma\pi^+\pi^-\ell^+\ell^-$
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¹ Using theoretical predictions for $B(\chi_{bJ}(2P) \rightarrow \gamma \gamma(1D))$.

$\Gamma(\pi^+\pi^- \gamma(1S))/\Gamma(\gamma\gamma \gamma(1S))$	Γ_4/Γ_1
VALUE CL%	DOCUMENT ID TECN COMMENT

<1.2	90	² BONVICINI 04	CLE3	$\gamma(3S) \rightarrow 4\gamma\ell^+\ell^-$
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² Assuming $J = 2$.

$\gamma(1D)$ REFERENCES				
DEL-AMO-SA.. 10R	PR D82 111102	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)	REFID=53634
BONVICINI 04	PR D70 032001	G. Bonvicini <i>et al.</i>	(CLEO Collab.)	REFID=49759

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NODE=M177M

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NODE=M177R02
 NODE=M177R02

NODE=M177R02;LINKAGE=BO

NODE=M177

REFID=53634
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$\chi_{b0}(2P)$

$I^G(JPC) = 0^+(0^{++})$
J needs confirmation.

Observed in radiative decay of the $\Upsilon(3S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$.

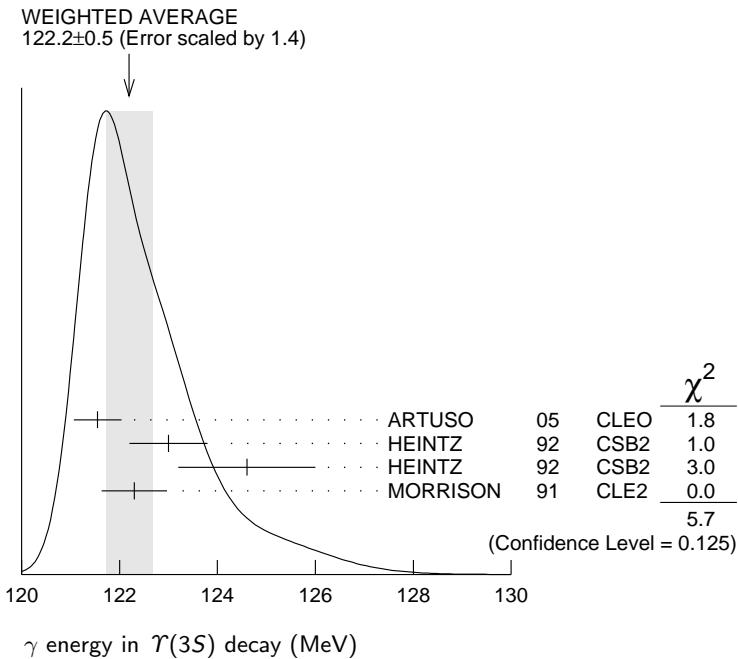
$\chi_{b0}(2P)$ MASS

VALUE (MeV)	DOCUMENT ID
10232.5 ± 0.4 ± 0.5 OUR EVALUATION	From γ energy below, using $\Upsilon(3S)$ mass = 10355.2 ± 0.5 MeV [10.2325 ± 0.0004 ± 0.0005 GeV OUR 2012 EVALUATION]

γ ENERGY IN $\Upsilon(3S)$ DECAY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
121.9 ± 0.4 OUR EVALUATION	Treating systematic errors as correlated			
122.2 ± 0.5 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.			
121.55 ± 0.16 ± 0.46	ARTUSO	05	CLEO	$\Upsilon(3S) \rightarrow \gamma X$
123.0 ± 0.8	4959	1 HEINTZ	92	$e^+ e^- \rightarrow \gamma X$
124.6 ± 1.4	17	2 HEINTZ	92	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$
122.3 ± 0.3 ± 0.6	9903	MORRISON	91	$e^+ e^- \rightarrow \gamma X$

¹A systematic uncertainty on the energy scale of 0.9% not included. Supersedes NARAIN 91.
²A systematic uncertainty on the energy scale of 0.9% not included. Supersedes HEINTZ 91.



$\chi_{b0}(2P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level
$\Gamma_1 \gamma \Upsilon(2S)$	(4.6 ± 2.1) %	
$\Gamma_2 \gamma \Upsilon(1S)$	(9 ± 6) × 10 ⁻³	
$\Gamma_3 D^0 X$	< 8.2 %	90%
$\Gamma_4 \pi^+ \pi^- K^+ K^- \pi^0$	< 3.4 × 10 ⁻⁵	90%
$\Gamma_5 2\pi^+ \pi^- K^- K_S^0$	< 5 × 10 ⁻⁵	90%
$\Gamma_6 2\pi^+ \pi^- K^- K_S^0 2\pi^0$	< 2.2 × 10 ⁻⁴	90%
$\Gamma_7 2\pi^+ 2\pi^- 2\pi^0$	< 2.4 × 10 ⁻⁴	90%
$\Gamma_8 2\pi^+ 2\pi^- K^+ K^-$	< 1.5 × 10 ⁻⁴	90%

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NODE=M079M
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DESIG=4
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DESIG=7
DESIG=8

Γ_9	$2\pi^+ 2\pi^- K^+ K^- \pi^0$	< 2.2	$\times 10^{-4}$	90%	DESIG=9
Γ_{10}	$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	< 1.1	$\times 10^{-3}$	90%	DESIG=10
Γ_{11}	$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	< 7	$\times 10^{-4}$	90%	DESIG=11
Γ_{12}	$3\pi^+ 3\pi^-$	< 7	$\times 10^{-5}$	90%	DESIG=12
Γ_{13}	$3\pi^+ 3\pi^- 2\pi^0$	< 1.2	$\times 10^{-3}$	90%	DESIG=13
Γ_{14}	$3\pi^+ 3\pi^- K^+ K^-$	< 1.5	$\times 10^{-4}$	90%	DESIG=14
Γ_{15}	$3\pi^+ 3\pi^- K^+ K^- \pi^0$	< 7	$\times 10^{-4}$	90%	DESIG=15
Γ_{16}	$4\pi^+ 4\pi^-$	< 1.7	$\times 10^{-4}$	90%	DESIG=16
Γ_{17}	$4\pi^+ 4\pi^- 2\pi^0$	< 6	$\times 10^{-4}$	90%	DESIG=17

$\chi_{b0}(2P)$ BRANCHING RATIOS

$\Gamma(\gamma \Upsilon(2S))/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
0.046 ± 0.020 ± 0.007		3 HEINTZ	92 CSB2	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.028	90	4 LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$
<0.089	90	5 CRAWFORD	92B CLE2	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$

3 Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.44 \pm 0.10)\%$, $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = (6.0 \pm 0.4 \pm 0.6)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91.

4 LEES 11J quotes a central value of $\Gamma(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(2S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))/\Gamma_{\text{total}} = (-0.3 \pm 0.2^{+0.5}_{-0.4})\%$.

5 Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.37 \pm 0.26)\%$, $B(\Upsilon(3S) \rightarrow \gamma\gamma \Upsilon(2S)) \times 2 B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) < 1.19 \times 10^{-4}$, and $B(\Upsilon(3S) \rightarrow \chi_{b0}(2P)\gamma) = 0.049$.

$\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
0.009 ± 0.006 ± 0.001		6 HEINTZ	92 CSB2	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.012	90	7 LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$
<0.025	90	8 CRAWFORD	92B CLE2	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$

6 Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.57 \pm 0.07)\%$, $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = (6.0 \pm 0.4 \pm 0.6)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91.

7 LEES 11J quotes a central value of $\Gamma(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))/\Gamma_{\text{total}} = (3.9 \pm 2.2^{+1.2}_{-0.6}) \times 10^{-4}$.

8 Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.57 \pm 0.07)\%$, $B(\Upsilon(3S) \rightarrow \gamma\gamma \Upsilon(1S)) \times 2 B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) < 0.63 \times 10^{-4}$, and $B(\Upsilon(3S) \rightarrow \chi_{b0}(2P)\gamma) = 0.049$.

$\Gamma(D^0 X)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
<8.2 × 10⁻²	90	9,10 BRIERE	08 CLEO	$\Upsilon(3S) \rightarrow \gamma D^0 X$	

9 For $p_{D^0} > 2.5$ GeV/c.

10 The authors also present their result as $(4.1 \pm 3.0 \pm 0.4) \times 10^{-2}$.

$\Gamma(\pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_4/Γ
<0.34	90	11 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma \pi^+ \pi^- K^+ K^- \pi^0$	

11 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow \pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))] < 2 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = 5.9 \times 10^{-2}$.

$\Gamma(2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}$

VALUE (units 10 ⁻⁴)	CL%	DOCUMENT ID	TECN	COMMENT	Γ_5/Γ
<0.5	90	12 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 2\pi^+ \pi^- K^- K_S^0$	

12 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))] < 3 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = 5.9 \times 10^{-2}$.

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NODE=M079R03

NODE=M079R03;LINKAGE=AS

$\Gamma(2\pi^+\pi^-K^-K_S^02\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.2	90	13 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+\pi^-K^-K_S^02\pi^0$
13 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 2\pi^+\pi^-K^-K_S^02\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 13 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_6/Γ NODE=M079R04
NODE=M079R04 $\Gamma(2\pi^+2\pi^-2\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.4	90	14 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+2\pi^-2\pi^0$
14 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 2\pi^+2\pi^-2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 14 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_7/Γ NODE=M079R05
NODE=M079R05 $\Gamma(2\pi^+2\pi^-K^+K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1.5	90	15 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+2\pi^-K^+K^-$
15 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 2\pi^+2\pi^-K^+K^-)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 9 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_8/Γ NODE=M079R06
NODE=M079R06 $\Gamma(2\pi^+2\pi^-K^+K^-\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<2.2	90	16 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+2\pi^-K^+K^-\pi^0$
16 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 2\pi^+2\pi^-K^+K^-\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 13 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_9/Γ NODE=M079R07
NODE=M079R07 $\Gamma(2\pi^+2\pi^-K^+K^-2\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<11	90	17 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+2\pi^-K^+K^-2\pi^0$
17 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 2\pi^+2\pi^-K^+K^-2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 63 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{10}/Γ NODE=M079R08
NODE=M079R08 $\Gamma(3\pi^+2\pi^-K^-K_S^0\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<7	90	18 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 3\pi^+2\pi^-K^-K_S^0\pi^0$
18 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 3\pi^+2\pi^-K^-K_S^0\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 39 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{11}/Γ NODE=M079R09
NODE=M079R09 $\Gamma(3\pi^+3\pi^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<0.7	90	19 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 3\pi^+3\pi^-$
19 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 3\pi^+3\pi^-)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 4 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{12}/Γ NODE=M079R10
NODE=M079R10 $\Gamma(3\pi^+3\pi^-2\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<12	90	20 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 3\pi^+3\pi^-2\pi^0$
20 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 3\pi^+3\pi^-2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 72 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{13}/Γ NODE=M079R11
NODE=M079R11 $\Gamma(3\pi^+3\pi^-K^+K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1.5	90	21 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 3\pi^+3\pi^-K^+K^-$
21 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 3\pi^+3\pi^-K^+K^-)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P))] < 9 \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{14}/Γ NODE=M079R12
NODE=M079R12

NODE=M079R12;LINKAGE=AS

$\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<7	90	22 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$
22 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))] < 43 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{15}/Γ NODE=M079R13
NODE=M079R13 $\Gamma(4\pi^+ 4\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<1.7	90	23 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 4\pi^+ 4\pi^-$
23 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 4\pi^+ 4\pi^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))] < 10 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{16}/Γ NODE=M079R14
NODE=M079R14 $\Gamma(4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<6	90	24 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$
24 ASNER 08A reports $[\Gamma(\chi_{b0}(2P) \rightarrow 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))] < 38 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = 5.9 \times 10^{-2}$.				

 Γ_{17}/Γ NODE=M079R15
NODE=M079R15

$$\Gamma(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))/\Gamma_{\text{total}}$$

$$\Gamma_2/\Gamma \times \frac{\Gamma(\Upsilon(3S))}{\Gamma_{21}} / \Gamma^{\Upsilon(3S)}$$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<8.2	90	25 LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$
25 LEES 11J quotes a central value of $\Gamma(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))/\Gamma_{\text{total}} = (3.9 \pm 2.2^{+1.2}_{-0.6}) \times 10^{-4}$ and derives a 90% CL upper limit of $B(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(1S)) < 1.2\%$ using $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = (5.9 \pm 0.6)\%$.				

NODE=M079B01
NODE=M079B01

$$\Gamma(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(2S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))/\Gamma_{\text{total}}$$

$$\Gamma_1/\Gamma \times \frac{\Gamma(\Upsilon(3S))}{\Gamma_{21}} / \Gamma^{\Upsilon(3S)}$$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<1.6	90	26 LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$
26 LEES 11J quotes a central value of $\Gamma(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(2S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P))/\Gamma_{\text{total}} = (-0.3 \pm 0.2^{+0.5}_{-0.4})\%$ and derives a 90% CL upper limit of $B(\chi_{b0}(2P) \rightarrow \gamma \Upsilon(2S)) < 2.8\%$ using $B(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(2P)) = (5.9 \pm 0.6)\%$.				

NODE=M079B01;LINKAGE=LE

 $\chi_{b0}(2P)$ REFERENCES

LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BRIERE	08	PR D78 092007	R.A. Briere <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
CRAWFORD	92B	PL B294 139	G. Crawford, R. Fulton	(CLEO Collab.)
HEINTZ	92	PR D46 1928	U. Heintz <i>et al.</i>	(CUSB II Collab.)
HEINTZ	91	PRL 66 1563	U. Heintz <i>et al.</i>	(CUSB Collab.)
MORRISON	91	PRL 67 1696	R.J. Morrison <i>et al.</i>	(CLEO Collab.)
NARAIN	91	PRL 66 3113	M. Narain <i>et al.</i>	(CUSB Collab.)

NODE=M079B02

NODE=M079B02

NODE=M079B02;LINKAGE=LE

NODE=M079B02

NODE=M079B02

NODE=M079B02;LINKAGE=LE

NODE=M079B02

$\chi_{b1}(2P)$

$I^G(JPC) = 0^+(1^{++})$
J needs confirmation.

Observed in radiative decay of the $\Upsilon(3S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$.

$\chi_{b1}(2P)$ MASS

VALUE (MeV)

DOCUMENT ID

10255.46 ± 0.22 ± 0.50 OUR EVALUATION From γ energy below, using $\Upsilon(3S)$ mass = 10355.2 ± 0.5 MeV [$10.25546 \pm 0.00022 \pm 0.00050$ GeV OUR 2012 EVALUATION]

$$m_{\chi_{b1}(2P)} - m_{\chi_{b0}(2P)}$$

VALUE (MeV)

DOCUMENT ID

TECN

COMMENT

23.5 ± 0.7 ± 0.7

¹ HEINTZ

92

CSB2

$e^+ e^- \rightarrow \gamma X, \ell^+ \ell^- \gamma\gamma$

¹ From the average photon energy for inclusive and exclusive events. Supersedes NARAIN 91.

γ ENERGY IN $\Upsilon(3S)$ DECAY

VALUE (MeV)

EVTs

DOCUMENT ID

TECN

COMMENT

99.26 ± 0.22 OUR EVALUATION

Treating systematic errors as correlated

99.53 ± 0.23 OUR AVERAGE

Error includes scale factor of 1.3. See the ideogram below.

$99.15 \pm 0.07 \pm 0.25$

ARTUSO 05 CLEO $\Upsilon(3S) \rightarrow \gamma X$

99 ± 1

169

CRAWFORD 92B CLE2 $e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$

100.1 ± 0.4

11147

² HEINTZ 92 CSB2 $e^+ e^- \rightarrow \gamma X$

100.2 ± 0.5

223

³ HEINTZ 92 CSB2 $e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$

$99.5 \pm 0.1 \pm 0.5$

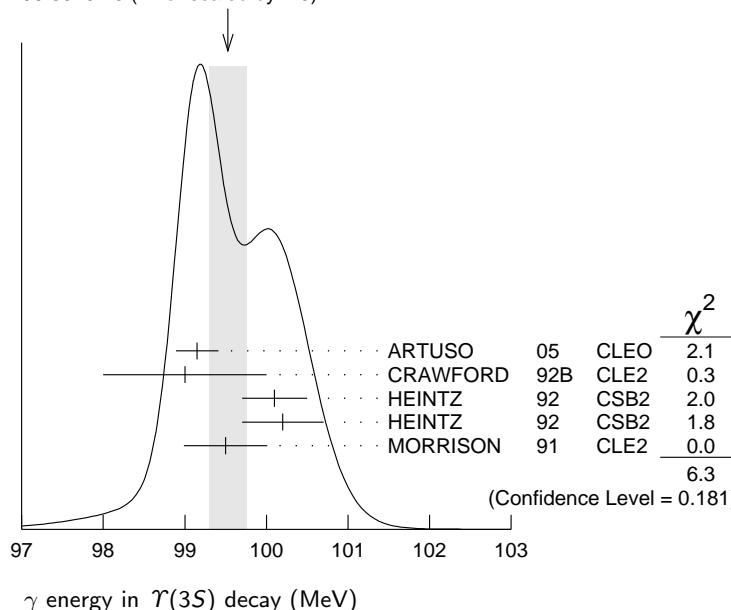
25759

MORRISON 91 CLE2 $e^+ e^- \rightarrow \gamma X$

² A systematic uncertainty on the energy scale of 0.9% not included. Supersedes NARAIN 91.

³ A systematic uncertainty on the energy scale of 0.9% not included. Supersedes HEINTZ 91.

WEIGHTED AVERAGE
 99.53 ± 0.23 (Error scaled by 1.3)



NODE=M080

NODE=M080

NODE=M080M

NODE=M080M

NEW;→ UNCHECKED ←

NODE=M080M2

NODE=M080M2

NODE=M080M2;LINKAGE=A

NODE=M080DM

NODE=M080DM

→ UNCHECKED ←

OCCUR=2

NODE=M080DM;LINKAGE=A

NODE=M080DM;LINKAGE=B

$\chi_{b1}(2P)$ DECAY MODES

NODE=M080215;NODE=M080

Mode	Fraction (Γ_i/Γ)	Scale factor
$\Gamma_1 \omega \Upsilon(1S)$	(1.63 \pm 0.40) %	
$\Gamma_2 \gamma \Upsilon(2S)$	(19.9 \pm 1.9) %	
$\Gamma_3 \gamma \Upsilon(1S)$	(9.2 \pm 0.8) %	1.1
$\Gamma_4 \pi\pi\chi_{b1}(1P)$	(9.1 \pm 1.3) $\times 10^{-3}$	
$\Gamma_5 D^0 X$	(8.8 \pm 1.7) %	
$\Gamma_6 \pi^+ \pi^- K^+ K^- \pi^0$	(3.1 \pm 1.0) $\times 10^{-4}$	
$\Gamma_7 2\pi^+ \pi^- K^- K_S^0$	(1.1 \pm 0.5) $\times 10^{-4}$	
$\Gamma_8 2\pi^+ \pi^- K^- K_S^0 2\pi^0$	(7.7 \pm 3.2) $\times 10^{-4}$	
$\Gamma_9 2\pi^+ 2\pi^- 2\pi^0$	(5.9 \pm 2.0) $\times 10^{-4}$	
$\Gamma_{10} 2\pi^+ 2\pi^- K^+ K^-$	(10 \pm 4) $\times 10^{-5}$	
$\Gamma_{11} 2\pi^+ 2\pi^- K^+ K^- \pi^0$	(5.5 \pm 1.8) $\times 10^{-4}$	
$\Gamma_{12} 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	(10 \pm 4) $\times 10^{-4}$	
$\Gamma_{13} 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	(6.7 \pm 2.6) $\times 10^{-4}$	
$\Gamma_{14} 3\pi^+ 3\pi^-$	(1.2 \pm 0.4) $\times 10^{-4}$	
$\Gamma_{15} 3\pi^+ 3\pi^- 2\pi^0$	(1.2 \pm 0.4) $\times 10^{-3}$	
$\Gamma_{16} 3\pi^+ 3\pi^- K^+ K^-$	(2.0 \pm 0.8) $\times 10^{-4}$	
$\Gamma_{17} 3\pi^+ 3\pi^- K^+ K^- \pi^0$	(6.1 \pm 2.2) $\times 10^{-4}$	
$\Gamma_{18} 4\pi^+ 4\pi^-$	(1.7 \pm 0.6) $\times 10^{-4}$	
$\Gamma_{19} 4\pi^+ 4\pi^- 2\pi^0$	(1.9 \pm 0.7) $\times 10^{-3}$	

 $\chi_{b1}(2P)$ BRANCHING RATIOS **$\Gamma(\omega \Upsilon(1S))/\Gamma_{\text{total}}$**

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
$1.63^{+0.35+0.16}_{-0.31-0.15}$	$32.6^{+6.9}_{-6.1}$ ⁴	CRONIN-HEN..04	CLE3	$\Upsilon(3S) \rightarrow \gamma \omega \Upsilon(1S)$	

⁴ Using $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = (11.3 \pm 0.6)\%$ and $B(\Upsilon(1S) \rightarrow \ell^+ \ell^-) = 2 B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = 2 (2.48 \pm 0.06)\%$.

 $\Gamma(\gamma \Upsilon(2S))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
0.199 ± 0.019 OUR AVERAGE					
0.190 \pm 0.018 \pm 0.017	4.3k	⁵ LEES	11J	$\Upsilon(3S) \rightarrow X \gamma$	
0.356 \pm 0.042 \pm 0.092		⁶ CRAWFORD	92B	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$	
0.199 \pm 0.020 \pm 0.022		⁷ HEINTZ	92	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$	

⁵ LEES 11J reports $[\Gamma(\chi_{b1}(2P) \rightarrow \gamma \Upsilon(2S))/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P))] = (2.4 \pm 0.1 \pm 0.2) \times 10^{-2}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁶ Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.37 \pm 0.26)\%$, $B(\Upsilon(3S) \rightarrow \gamma \gamma \Upsilon(2S)) \times 2 B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (10.23 \pm 1.20 \pm 1.26) \times 10^{-4}$, and $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = 0.105^{+0.003}_{-0.002} \pm 0.013$.

⁷ Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.44 \pm 0.10)\%$, $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = (11.5 \pm 0.5 \pm 0.5)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91.

 $\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
0.092 ± 0.008 OUR AVERAGE				Error includes scale factor of 1.1.	
0.098 \pm 0.005 \pm 0.009	15k	⁸ LEES	11J	$\Upsilon(3S) \rightarrow X \gamma$	
0.120 \pm 0.021 \pm 0.021		⁹ CRAWFORD	92B	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$	
0.080 \pm 0.009 \pm 0.007		¹⁰ HEINTZ	92	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$	

⁸ LEES 11J reports $[\Gamma(\chi_{b1}(2P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P))] = (12.4 \pm 0.3 \pm 0.6) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁹ Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.57 \pm 0.07)\%$, $B(\Upsilon(3S) \rightarrow \gamma \gamma \Upsilon(1S)) \times 2 B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (6.47 \pm 1.12 \pm 0.82) \times 10^{-4}$ and $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = 0.105^{+0.003}_{-0.002} \pm 0.013$.

¹⁰ Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.57 \pm 0.07)\%$, $B(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) = (11.5 \pm 0.5 \pm 0.5)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91.

NODE=M080220

NODE=M080R3
NODE=M080R3

NODE=M080R3;LINKAGE=CR

NODE=M080R2
NODE=M080R2

NODE=M080R2;LINKAGE=LE

NODE=M080R2;LINKAGE=B

NODE=M080R2;LINKAGE=C

NODE=M080R1
NODE=M080R1

NODE=M080R1;LINKAGE=LE

NODE=M080R1;LINKAGE=B

NODE=M080R1;LINKAGE=C

$\Gamma(\pi\pi\chi_{b1}(1P))/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_4/Γ
9.1±1.3 OUR AVERAGE					
9.2±1.1±0.8	31k	11 LEES	11C BABR	$e^+ e^- \rightarrow \pi^+ \pi^- X$	
8.6±2.3±2.1		12 CAWLFIELD	06 CLE3	$\gamma(3S) \rightarrow 2(\gamma\pi\ell)$	
11 LEES 11C measures $B(\gamma(3S) \rightarrow \chi_{b1}(2P)X) \times B(\chi_{b1}(2P) \rightarrow \chi_{b1}(1P)\pi^+\pi^-) = (1.16 \pm 0.07 \pm 0.12) \times 10^{-3}$. We derive the value assuming $B(\gamma(3S) \rightarrow \chi_{b1}(2P)X) = B(\gamma(3S) \rightarrow \chi_{b1}(2P)\gamma) = (12.6 \pm 1.2) \times 10^{-2}$.					
12 CAWLFIELD 06 quote $\Gamma(\chi_{b1}(2P) \rightarrow \pi\pi\chi_b(1P)) = 0.83 \pm 0.22 \pm 0.08 \pm 0.19$ keV assuming I-spin conservation, no D-wave contribution, $\Gamma(\chi_{b1}(2P)) = 96 \pm 16$ keV, and $\Gamma(\chi_{b2}(2P)) = 138 \pm 19$ keV.					

 $\Gamma(D^0 X)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_5/Γ
8.8±1.5±0.8	2243	13 BRIERE	08 CLEO	$\gamma(3S) \rightarrow \gamma D^0 X$	
13 For $p_{D^0} > 2.5$ GeV/c.					

 $\Gamma(\pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_6/Γ
3.1±1.0±0.3	30	14 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma\pi^+\pi^-K^+K^-\pi^0$	
14 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow \pi^+\pi^-K^+K^-\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P))] = (39 \pm 8 \pm 9) \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\Gamma(2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_7/Γ
1.1±0.5±0.1	10	15 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+ \pi^- K^- K_S^0$	
15 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P))] = (14 \pm 5 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\Gamma(2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_8/Γ
7.7±3.1±0.7	15	16 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+ \pi^- K^- 2\pi^0$	
16 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P))] = (97 \pm 30 \pm 26) \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\Gamma(2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_9/Γ
5.9±2.0±0.5	36	17 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- 2\pi^0$	
17 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P))] = (74 \pm 16 \pm 19) \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\Gamma(2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{10}/Γ
1.0±0.4±0.1	12	18 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^-$	
18 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P))] = (12 \pm 4 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\Gamma(2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$

<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	Γ_{11}/Γ
5.5±1.7±0.5	38	19 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$	
19 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P))] = (69 \pm 13 \pm 17) \times 10^{-6}$ which we divide by our best value $B(\gamma(3S) \rightarrow \gamma\chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M080R4

NODE=M080R4

NODE=M080R4;LINKAGE=LE

NODE=M080R01
NODE=M080R01

NODE=M080R01;LINKAGE=BR

NODE=M080R02
NODE=M080R02

NODE=M080R02;LINKAGE=AS

NODE=M080R03
NODE=M080R03NODE=M080R04
NODE=M080R04NODE=M080R05
NODE=M080R05NODE=M080R06
NODE=M080R06NODE=M080R07
NODE=M080R07

NODE=M080R07;LINKAGE=AS

$\Gamma(2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
9.6±3.5±0.9	27	20 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$
20 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (121 \pm 29 \pm 33) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
6.7±2.5±0.6	17	21 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$
21 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (85 \pm 23 \pm 22) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^-)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.2±0.4±0.1	18	22 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^-$
22 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (15 \pm 4 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
12±4±1	44	23 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^- 2\pi^0$
23 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (150 \pm 30 \pm 40) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}$ Γ_{16}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.0±0.7±0.2	16	24 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^-$
24 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (25 \pm 7 \pm 6) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$ Γ_{17}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
6.1±2.1±0.6	25	25 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$
25 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (77 \pm 17 \pm 21) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(4\pi^+ 4\pi^-)/\Gamma_{\text{total}}$ Γ_{18}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.7±0.6±0.2	16	26 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 4\pi^+ 4\pi^-$
26 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 4\pi^+ 4\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (22 \pm 6 \pm 5) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}$ Γ_{19}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
19±7±2	41	27 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$
27 ASNER 08A reports $[\Gamma(\chi_{b1}(2P) \rightarrow 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P))] = (241 \pm 47 \pm 72) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b1}(2P)) = (12.6 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

NODE=M080R08
NODE=M080R08

NODE=M080R08;LINKAGE=AS

NODE=M080R09
NODE=M080R09

NODE=M080R09;LINKAGE=AS

NODE=M080R10
NODE=M080R10

NODE=M080R10;LINKAGE=AS

NODE=M080R11
NODE=M080R11

NODE=M080R11;LINKAGE=AS

NODE=M080R12
NODE=M080R12

NODE=M080R12;LINKAGE=AS

NODE=M080R13
NODE=M080R13

NODE=M080R13;LINKAGE=AS

NODE=M080R14
NODE=M080R14

NODE=M080R14;LINKAGE=AS

NODE=M080R15
NODE=M080R15

NODE=M080R15;LINKAGE=AS

$\chi_{b1}(2P)$ Cross-Particle Branching Ratios

$$\Gamma(\chi_{b1}(2P) \rightarrow \gamma \Upsilon(1S)) / \Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) / \Gamma_{\text{total}}$$

$$\Gamma_3 / \Gamma \times \frac{\Gamma_{20}^{\Upsilon(3S)}}{\Gamma^{\Upsilon(3S)}}$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$12.4 \pm 0.3 \pm 0.6$	15k	LEES	11J	BABR $\Upsilon(3S) \rightarrow X \gamma$

NODE=M080230

$$\Gamma(\chi_{b1}(2P) \rightarrow \gamma \Upsilon(2S)) / \Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(2P)) / \Gamma_{\text{total}}$$

$$\Gamma_2 / \Gamma \times \frac{\Gamma_{20}^{\Upsilon(3S)}}{\Gamma^{\Upsilon(3S)}}$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$2.4 \pm 0.1 \pm 0.2$	4.3k	LEES	11J	BABR $\Upsilon(3S) \rightarrow X \gamma$

NODE=M080B01
NODE=M080B01

$$B(\chi_{b1}(2P) \rightarrow \chi_{b1}(1P) \pi^+ \pi^-) \times B(\Upsilon(3S) \rightarrow \chi_{b1}(2P) X)$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.16 \pm 0.07 \pm 0.12$	31k	LEES	11C	BABR $e^+ e^- \rightarrow \pi^+ \pi^- X$

NODE=M080B02
NODE=M080B02

$$B(\chi_{b2}(2P) \rightarrow pX + \bar{p}X) / B(\chi_{b1}(2P) \rightarrow pX + \bar{p}X)$$

VALUE	DOCUMENT ID	TECN	COMMENT
$1.109 \pm 0.007 \pm 0.040$	BRIERE	07	CLEO $\Upsilon(3S) \rightarrow \gamma \chi_{bJ}(2P)$

NODE=M080R16
NODE=M080R16

$$B(\chi_{b0}(2P) \rightarrow pX + \bar{p}X) / B(\chi_{b1}(2P) \rightarrow pX + \bar{p}X)$$

VALUE	DOCUMENT ID	TECN	COMMENT
$1.082 \pm 0.025 \pm 0.060$	BRIERE	07	CLEO $\Upsilon(3S) \rightarrow \gamma \chi_{bJ}(2P)$

NODE=M080R20
NODE=M080R20 **$\chi_{b1}(2P)$ REFERENCES**

LEES	11C	PR D84 011104	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BRIERE	08	PR D78 092007	R.A. Briere <i>et al.</i>	(CLEO Collab.)
BRIERE	07	PR D76 012005	R.A. Briere <i>et al.</i>	(CLEO Collab.)
CAWLFIELD	06	PR D73 012003	C. Cawlfield <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
CRONIN-HEN...	04	PRL 92 222002	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)
CRAWFORD	92B	PL B294 139	G. Crawford, R. Fulton	(CLEO Collab.)
HEINTZ	92	PR D46 1928	U. Heintz <i>et al.</i>	(CUSB II Collab.)
HEINTZ	91	PRL 66 1563	U. Heintz <i>et al.</i>	(CUSB Collab.)
MORRISON	91	PRL 67 1696	R.J. Morrison <i>et al.</i>	(CLEO Collab.)
NARAIN	91	PRL 66 3113	M. Narain <i>et al.</i>	(CUSB Collab.)

NODE=M080

REFID=16775
REFID=53936
REFID=52574
REFID=52577
REFID=51887
REFID=50997
REFID=50454
REFID=49766
REFID=43177
REFID=43604
REFID=41580
REFID=41634
REFID=41586 **$h_b(2P)$**

$$I^G(J^{PC}) = ?^?(1^{+-})$$

OMITTED FROM SUMMARY TABLE

Quantum numbers are quark model predictions.

NODE=M205

 $h_b(2P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
10259.8 ± 1.2 OUR AVERAGE		[10.2598 ± 0.0015 GeV OUR 2012 AVERAGE]		

NODE=M205M

$10259.8 \pm 0.5 \pm 1.1$	90k	MIZUK	12	BELL $e^+ e^- \rightarrow \pi^+ \pi^-$ hadrons
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NODE=M205M

• • • We do not use the following data for averages, fits, limits, etc. • • •

NEW

$10259.8 \pm 0.6 \pm 1.4$	83.9k	¹ ADACHI	12	BELL $10.86 e^+ e^- \rightarrow \pi^+ \pi^-$ MM
---------------------------	-------	---------------------	----	---

NODE=M205M;LINKAGE=AD

¹ Superseded by MIZUK 12.

NODE=M205215;NODE=M205

 $h_b(2P)$ DECAY MODES

Mode	Fraction (Γ_i / Γ)
Γ_1 hadrons	not seen
Γ_2 $\eta_b(1S)\gamma$	(22 ± 5) %
Γ_3 $\eta_b(2S)\gamma$	(48 ± 13) %

DESIG=1

DESIG=2

DESIG=3

 $h_b(2P)$ BRANCHING RATIOS

$\Gamma(\text{hadrons}) / \Gamma_{\text{total}}$	Γ_1 / Γ
not seen	$83.9k$ ADACHI 12 BELL $10.86 e^+ e^- \rightarrow \pi^+ \pi^-$ MM

NODE=M205225
NODE=M205R01
NODE=M205R01

$\Gamma(\eta_b(1S)\gamma)/\Gamma_{\text{total}}$	Γ_2/Γ
<i>VALUE (units 10^{-2})</i>	<i>EVTS</i>
$22.3 \pm 3.8^{+3.1}_{-3.3}$	10k
MIZUK	12
BELL	$e^+ e^- \rightarrow (\gamma) \pi^+ \pi^- \text{ hadrons}$
$\Gamma(\eta_b(2S)\gamma)/\Gamma_{\text{total}}$	Γ_3/Γ
<i>VALUE (units 10^{-2})</i>	<i>EVTS</i>
$47.5 \pm 10.5^{+6.8}_{-7.7}$	26k
MIZUK	12
BELL	$e^+ e^- \rightarrow (\gamma) \pi^+ \pi^- \text{ hadrons}$

 $\chi_{b2}(2P)$ REFERENCES

ADACHI	12	PRL 108 032001	I. Adachi <i>et al.</i>	(BELLE Collab.)
MIZUK	12	PRL 109 232002	R. Mizuk <i>et al.</i>	(BELLE Collab.)

 $\chi_{b2}(2P)$

$$I^G(J^{PC}) = 0^+(2^{++})$$

J needs confirmation.

Observed in radiative decay of the $\Upsilon(3S)$, therefore $C = +$. Branching ratio requires E1 transition, M1 is strongly disfavored, therefore $P = +$.

 $\chi_{b2}(2P)$ MASS

<i>VALUE (MeV)</i>	<i>DOCUMENT ID</i>	<i>COMMENT</i>		
102686.5 $\pm 0.22 \pm 0.50$ OUR EVALUATION		From γ energy below, using $\Upsilon(3S)$ mass = 10355.2 ± 0.5 MeV [$10.26865 \pm 0.00022 \pm 0.00050$ GeV OUR 2012 EVALUATION]		

 $m_{\chi_{b2}(2P)} - m_{\chi_{b1}(2P)}$

<i>VALUE (MeV)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
$13.5 \pm 0.4 \pm 0.5$	¹ HEINTZ	92	CSB2 $e^+ e^- \rightarrow \gamma X, \ell^+ \ell^- \gamma \gamma$

¹ From the average photon energy for inclusive and exclusive events. Supersedes NARAIN 91.

 γ ENERGY IN $\Upsilon(3S)$ DECAY

<i>VALUE (MeV)</i>	<i>EVTS</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
86.19 ± 0.22 OUR EVALUATION				Treating systematic errors as correlated
86.40 ± 0.18 OUR AVERAGE				
$86.04 \pm 0.06 \pm 0.27$		ARTUSO	05	CLEO $\Upsilon(3S) \rightarrow \gamma X$
86 ± 1	101	CRAWFORD	92B	CLE2 $e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$
86.7 ± 0.4	10319	² HEINTZ	92	CSB2 $e^+ e^- \rightarrow \gamma X$
86.9 ± 0.4	157	³ HEINTZ	92	CSB2 $e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$
$86.4 \pm 0.1 \pm 0.4$	30741	MORRISON	91	CLE2 $e^+ e^- \rightarrow \gamma X$
2 A systematic uncertainty on the energy scale of 0.9% not included. Supersedes NARAIN 91.				
3 A systematic uncertainty on the energy scale of 0.9% not included. Supersedes HEINTZ 91.				

 $\chi_{b2}(2P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
$\Gamma_1 \omega \Upsilon(1S)$	$(1.10^{+0.34}_{-0.30}) \%$	
$\Gamma_2 \gamma \Upsilon(2S)$	$(10.6 \pm 2.6) \%$	S=2.0
$\Gamma_3 \gamma \Upsilon(1S)$	$(7.0 \pm 0.7) \%$	
$\Gamma_4 \pi \pi \chi_{b2}(1P)$	$(5.1 \pm 0.9) \times 10^{-3}$	
$\Gamma_5 D^0 X$	$< 2.4 \%$	CL=90%
$\Gamma_6 \pi^+ \pi^- K^+ K^- \pi^0$	$< 1.1 \times 10^{-4}$	CL=90%
$\Gamma_7 2\pi^+ \pi^- K^- K_S^0$	$< 9 \times 10^{-5}$	CL=90%
$\Gamma_8 2\pi^+ \pi^- K^- K_S^0 2\pi^0$	$< 7 \times 10^{-4}$	CL=90%
$\Gamma_9 2\pi^+ 2\pi^- 2\pi^0$	$(3.9 \pm 1.6) \times 10^{-4}$	

NODE=M205R02
NODE=M205R02NODE=M205R03
NODE=M205R03

NODE=M205

REFID=53962
REFID=54718

NODE=M081

NODE=M081

NODE=M081M

NODE=M081M
NEW; \rightarrow UNCHECKED \leftarrow

NODE=M081M2

NODE=M081M2

NODE=M081M2;LINKAGE=A

NODE=M081DM

NODE=M081DM
 \rightarrow UNCHECKED \leftarrow

OCCUR=2

NODE=M081DM;LINKAGE=A

NODE=M081DM;LINKAGE=B

NODE=M081215;NODE=M081

DESIG=3

DESIG=2

DESIG=1

DESIG=4

DESIG=5

DESIG=6

DESIG=7

DESIG=8

DESIG=9

Γ_{10}	$2\pi^+ 2\pi^- K^+ K^-$	$(9 \pm 4) \times 10^{-5}$	DESIG=10
Γ_{11}	$2\pi^+ 2\pi^- K^+ K^- \pi^0$	$(2.4 \pm 1.1) \times 10^{-4}$	DESIG=11
Γ_{12}	$2\pi^+ 2\pi^- K^+ K^- 2\pi^0$	$(4.7 \pm 2.3) \times 10^{-4}$	DESIG=12
Γ_{13}	$3\pi^+ 2\pi^- K^- K_S^0 \pi^0$	$< 4 \times 10^{-4}$	CL=90%
Γ_{14}	$3\pi^+ 3\pi^-$	$(9 \pm 4) \times 10^{-5}$	DESIG=14
Γ_{15}	$3\pi^+ 3\pi^- 2\pi^0$	$(1.2 \pm 0.4) \times 10^{-3}$	DESIG=15
Γ_{16}	$3\pi^+ 3\pi^- K^+ K^-$	$(1.4 \pm 0.7) \times 10^{-4}$	DESIG=16
Γ_{17}	$3\pi^+ 3\pi^- K^+ K^- \pi^0$	$(4.2 \pm 1.7) \times 10^{-4}$	DESIG=17
Γ_{18}	$4\pi^+ 4\pi^-$	$(9 \pm 5) \times 10^{-5}$	DESIG=18
Γ_{19}	$4\pi^+ 4\pi^- 2\pi^0$	$(1.3 \pm 0.5) \times 10^{-3}$	DESIG=19

$\chi_{b2}(2P)$ BRANCHING RATIOS

$\Gamma(\omega \Upsilon(1S))/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
$1.10^{+0.32}_{-0.28}{}^{+0.11}_{-0.10}$	$20.1^{+5.8}_{-5.1}$ 4	CRONIN-HEN..04	CLE3	$\Upsilon(3S) \rightarrow \gamma \omega \Upsilon(1S)$	

⁴ Using $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (11.4 \pm 0.8)\%$ and $B(\Upsilon(1S) \rightarrow \ell^+ \ell^-) = 2 B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = 2 (2.48 \pm 0.06)\%$.

$\Gamma(\gamma \Upsilon(2S))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
-------	------	-------------	------	---------	-------------------

0.106 ± 0.026 OUR AVERAGE Error includes scale factor of 2.0. See the ideogram below.

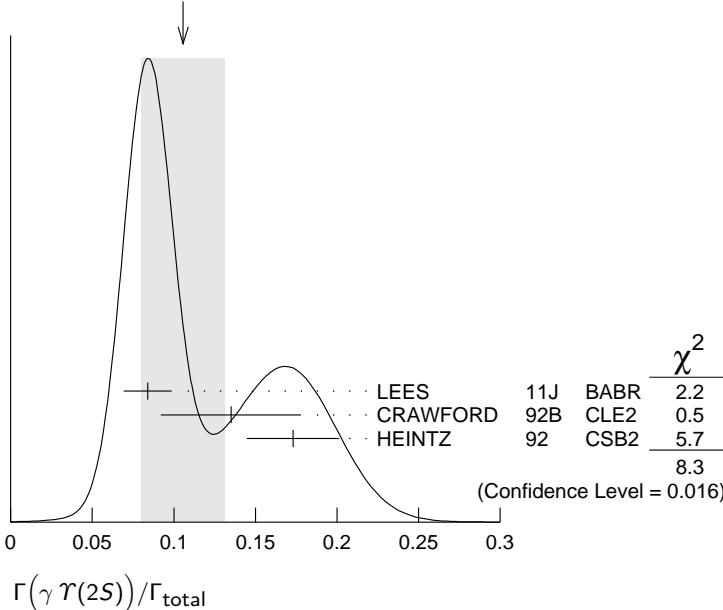
0.084 $\pm 0.011 \pm 0.010$ 2.5k 5 LEES 11J BABR $\Upsilon(3S) \rightarrow X \gamma$
 0.135 $\pm 0.025 \pm 0.035$ 6 CRAWFORD 92B CLE2 $e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$
 0.173 $\pm 0.021 \pm 0.019$ 7 HEINTZ 92 CSB2 $e^+ e^- \rightarrow \ell^+ \ell^- \gamma \gamma$

5 LEES 11J reports $[\Gamma(\chi_{b2}(2P) \rightarrow \gamma \Upsilon(2S))/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] = (1.1 \pm 0.1 \pm 0.1) \times 10^{-2}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

6 Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.37 \pm 0.26)\%$, $B(\Upsilon(3S) \rightarrow \gamma \gamma \Upsilon(2S)) \times 2 B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (4.98 \pm 0.94 \pm 0.62) \times 10^{-4}$, and $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = 0.135 \pm 0.003 \pm 0.017$.

7 Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.44 \pm 0.10)\%$, $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (11.1 \pm 0.5 \pm 0.4)\%$ and assuming $e \mu$ universality. Supersedes HEINTZ 91.

WEIGHTED AVERAGE
 0.106 ± 0.026 (Error scaled by 2.0)



NODE=M081220

NODE=M081R3
 NODE=M081R3

NODE=M081R3;LINKAGE=CR

NODE=M081R2
 NODE=M081R2

NODE=M081R2;LINKAGE=LE

NODE=M081R2;LINKAGE=B

NODE=M081R2;LINKAGE=C

$\Gamma(\gamma \Upsilon(1S))/\Gamma_{\text{total}}$					Γ_3/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.070±0.007 OUR AVERAGE					NODE=M081R1 NODE=M081R1
0.070±0.004±0.008	11k	8 LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$	
0.072±0.014±0.013		9 CRAWFORD	92B CLE2	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$	
0.070±0.010±0.006		10 HEINTZ	92 CSB2	$e^+ e^- \rightarrow \ell^+ \ell^- \gamma\gamma$	
8 LEES 11J reports $[\Gamma(\chi_{b2}(2P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] = (9.2 \pm 0.3 \pm 0.4) \times 10^{-3}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					NODE=M081R1;LINKAGE=LE
9 Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.57 \pm 0.07)\%$, $B(\Upsilon(3S) \rightarrow \gamma \gamma \Upsilon(2S)) \times 2 B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (5.03 \pm 0.94 \pm 0.63) \times 10^{-4}$, and $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = 0.135 \pm 0.003 \pm 0.017$.					NODE=M081R1;LINKAGE=B
10 Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.57 \pm 0.07)\%$, $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (11.1 \pm 0.5 \pm 0.4)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91.					NODE=M081R1;LINKAGE=C
$\Gamma(\pi\pi\chi_{b2}(1P))/\Gamma_{\text{total}}$					Γ_4/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
5.1±0.9 OUR AVERAGE					NODE=M081R4 NODE=M081R4
4.9±0.7±0.6	17k	11 LEES	11C BABR	$e^+ e^- \rightarrow \pi^+ \pi^- X$	
6.0±1.6±1.4		12 CAWLFIELD	06 CLE3	$\Upsilon(3S) \rightarrow 2(\gamma\pi\ell)$	
11 $(0.64 \pm 0.05 \pm 0.08) \times 10^{-3}$. We derive the value assuming $B(\Upsilon(3S) \rightarrow \chi_{b2}(2P)X) = B(\Upsilon(3S) \rightarrow \chi_{b2}(2P)\gamma) = (13.1 \pm 1.6) \times 10^{-2}$.					NODE=M081R4;LINKAGE=LE
12 CAWLFIELD 06 quote $\Gamma(\chi_{b2}(2P) \rightarrow \pi\pi\chi_b(1P)) = 0.83 \pm 0.22 \pm 0.08 \pm 0.19$ keV assuming I-spin conservation, no D-wave contribution, $\Gamma(\chi_{b1}(2P)) = 96 \pm 16$ keV, and $\Gamma(\chi_{b2}(2P)) = 138 \pm 19$ keV.					NODE=M081R4;LINKAGE=CA
$\Gamma(D^0 X)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<2.4×10⁻²	90	13,14 BRIERE	08 CLEO	$\Upsilon(3S) \rightarrow \gamma D^0 X$	
13 For $p_{D^0} > 2.5$ GeV/c.					
14 The authors also present their result as $(0.2 \pm 1.4 \pm 0.1) \times 10^{-2}$.					
$\Gamma(\pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$					Γ_6/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<1.1	90	15 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma \pi^+ \pi^- K^+ K^- \pi^0$	
15 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow \pi^+ \pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] < 14 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = 13.1 \times 10^{-2}$.					
$\Gamma(2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}$					Γ_7/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<0.9	90	16 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 2\pi^+ \pi^- K^- K_S^0$	
16 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 2\pi^+ \pi^- K^- K_S^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] < 12 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = 13.1 \times 10^{-2}$.					
$\Gamma(2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}$					Γ_8/Γ
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	
<7	90	17 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 2\pi^+ \pi^- K^- 2\pi^0$	
17 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 2\pi^+ \pi^- K^- K_S^0 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] < 87 \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = 13.1 \times 10^{-2}$.					
$\Gamma(2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}$					Γ_9/Γ
VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	
3.9±1.6±0.5	23	18 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 2\pi^+ 2\pi^- 2\pi^0$	
18 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 2\pi^+ 2\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] = (51 \pm 16 \pm 13) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

$\Gamma(2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.9±0.4±0.1	11	19 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^-$
19 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 2\pi^+ 2\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (12 \pm 4 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.4±1.0±0.3	16	20 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- \pi^0$
20 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (32 \pm 11 \pm 8) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
4.7±2.2±0.6	14	21 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 2\pi^+ 2\pi^- K^+ K^- 2\pi^0$
21 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 2\pi^+ 2\pi^- K^+ K^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (62 \pm 23 \pm 17) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<4	90	22 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 2\pi^- K^- K_S^0 \pi^0$
22 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 3\pi^+ 2\pi^- K^- K_S^0 \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] < 58 \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = 13.1 \times 10^{-2}$.				

 $\Gamma(3\pi^+ 3\pi^-)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.9±0.4±0.1	14	23 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^-$
23 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (12 \pm 4 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
12±4±1	45	24 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^- 2\pi^0$
24 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 3\pi^+ 3\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (159 \pm 33 \pm 43) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}$ Γ_{16}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.4±0.7±0.2	12	25 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^-$
25 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 3\pi^+ 3\pi^- K^+ K^-)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (19 \pm 7 \pm 5) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

 $\Gamma(3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}$ Γ_{17}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
4.2±1.7±0.5	16	26 ASNER	08A CLEO	$\Gamma(3S) \rightarrow \gamma 3\pi^+ 3\pi^- K^+ K^- \pi^0$
26 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 3\pi^+ 3\pi^- K^+ K^- \pi^0)/\Gamma_{\text{total}}] \times [B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P))] = (55 \pm 16 \pm 15) \times 10^{-6}$ which we divide by our best value $B(\Gamma(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.				

NODE=M081R06
NODE=M081R06

NODE=M081R06;LINKAGE=AS

NODE=M081R07
NODE=M081R07

NODE=M081R07;LINKAGE=AS

NODE=M081R08
NODE=M081R08

NODE=M081R08;LINKAGE=AS

NODE=M081R09
NODE=M081R09

NODE=M081R09;LINKAGE=AS

NODE=M081R10
NODE=M081R10

NODE=M081R10;LINKAGE=AS

NODE=M081R11
NODE=M081R11

NODE=M081R11;LINKAGE=AS

NODE=M081R12
NODE=M081R12

NODE=M081R12;LINKAGE=AS

NODE=M081R13
NODE=M081R13

NODE=M081R13;LINKAGE=AS

$\Gamma(4\pi^+ 4\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{18}/Γ
0.9±0.4±0.1	9	27 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 4\pi^+ 4\pi^-$	
27 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 4\pi^+ 4\pi^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] = (12 \pm 5 \pm 3) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\Gamma(4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{19}/Γ
13±5±2	27	28 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma 4\pi^+ 4\pi^- 2\pi^0$	
28 ASNER 08A reports $[\Gamma(\chi_{b2}(2P) \rightarrow 4\pi^+ 4\pi^- 2\pi^0)/\Gamma_{\text{total}}] \times [B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))] = (165 \pm 46 \pm 50) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P)) = (13.1 \pm 1.6) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

 $\chi_{b2}(2P)$ Cross-Particle Branching Ratios

$$\Gamma(\chi_{b2}(2P) \rightarrow \gamma \Upsilon(1S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))/\Gamma_{\text{total}} \quad \Gamma_3/\Gamma \times \Gamma_{19}^{\Upsilon(3S)}/\Gamma^{\Upsilon(3S)}$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_3/\Gamma \times \Gamma_{19}^{\Upsilon(3S)}/\Gamma^{\Upsilon(3S)}$
9.2±0.3±0.4	11k	LEES	11J BABR	$\Upsilon(3S) \rightarrow X \gamma$	

$$\Gamma(\chi_{b2}(2P) \rightarrow \gamma \Upsilon(2S))/\Gamma_{\text{total}} \times \Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(2P))/\Gamma_{\text{total}} \quad \Gamma_2/\Gamma \times \Gamma_{19}^{\Upsilon(3S)}/\Gamma^{\Upsilon(3S)}$$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_2/\Gamma \times \Gamma_{19}^{\Upsilon(3S)}/\Gamma^{\Upsilon(3S)}$
1.1±0.1±0.1	2.5k	LEES	11J BABR	$\Upsilon(3S) \rightarrow X \gamma$	

$$B(\chi_{b2}(2P) \rightarrow \chi_{b2}(1P) \pi^+ \pi^-) \times B(\Upsilon(3S) \rightarrow \chi_{b2}(2P) X)$$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_{16}/\Gamma \times \Gamma_{19}^{\Upsilon(3S)}/\Gamma^{\Upsilon(3S)}$
0.64±0.05±0.08	17k	LEES	11C BABR	$e^+ e^- \rightarrow \pi^+ \pi^- X$	

 $\chi_{b2}(2P)$ REFERENCES

LEES	11C	PR D84 011104	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BRIERE	08	PR D78 092007	R.A. Briere <i>et al.</i>	(CLEO Collab.)
CAWLFIELD	06	PR D73 012003	C. Cawfield <i>et al.</i>	(CLEO Collab.)
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)
CRONIN-HEN... 04	04	PRL 92 222002	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)
CRAWFORD	92B	PL B294 139	G. Crawford, R. Fulton	(CLEO Collab.)
HEINTZ	92	PR D46 1928	U. Heintz <i>et al.</i>	(CUSB II Collab.)
HEINTZ	91	PRL 66 1563	U. Heintz <i>et al.</i>	(CUSB Collab.)
MORRISON	91	PRL 67 1696	R.J. Morrison <i>et al.</i>	(CLEO Collab.)
NARAIN	91	PRL 66 3113	M. Narain <i>et al.</i>	(CUSB Collab.)

NODE=M081R14
NODE=M081R14

NODE=M081R14;LINKAGE=AS

NODE=M081R15
NODE=M081R15

NODE=M081R15;LINKAGE=AS

NODE=M081230

NODE=M081B01
NODE=M081B01NODE=M081B02
NODE=M081B02NODE=M081R16
NODE=M081R16

NODE=M081

REFID=16775
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REFID=52574
REFID=52577
REFID=50997
REFID=50454
REFID=49766
REFID=43177
REFID=43604
REFID=41580
REFID=41634
REFID=41586

$\Upsilon(3S)$ $I^G(J^{PC}) = 0^-(1^- -)$ **$\Upsilon(3S)$ MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
10355.2±0.5 OUR AVERAGE	[10.3552 ± 0.0005 GeV OUR 2012 AVERAGE]		
10355.2±0.5	1 ARTAMONOV 00	MD1	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •			
10355.3±0.5	2,3 BARU	86B REDE	$e^+ e^- \rightarrow$ hadrons
1 Reanalysis of BARU 86B using new electron mass (COHEN 87).			
2 Reanalysis of ARTAMONOV 84.			
3 Superseded by ARTAMONOV 00.			

NODE=M048M

NODE=M048M

NEW

NODE=M048M;LINKAGE=AR
NODE=M048M;LINKAGE=C
NODE=M048M;LINKAGE=RZ **$m_{\Upsilon(3S)} - m_{\Upsilon(2S)}$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
331.50±0.02±0.13	LEES	11C BABR	$e^+ e^- \rightarrow \pi^+ \pi^- X$

NODE=M048DM2

NODE=M048DM2

NODE=M048W

NODE=M048W
→ UNCHECKED ←

NODE=M048215;NODE=M048

 $\Upsilon(3S)$ WIDTH

VALUE (keV)	DOCUMENT ID
20.32±1.85 OUR EVALUATION	See the Note on "Width Determinations of the Υ States"

 $\Upsilon(3S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
$\Gamma_1 \Upsilon(2S)$ anything	(10.6 ± 0.8) %	
$\Gamma_2 \Upsilon(2S) \pi^+ \pi^-$	(2.82 ± 0.18) %	S=1.6
$\Gamma_3 \Upsilon(2S) \pi^0 \pi^0$	(1.85 ± 0.14) %	
$\Gamma_4 \Upsilon(2S) \gamma \gamma$	(5.0 ± 0.7) %	
$\Gamma_5 \Upsilon(2S) \pi^0$	< 5.1 × 10 ⁻⁴	CL=90%
$\Gamma_6 \Upsilon(1S) \pi^+ \pi^-$	(4.37 ± 0.08) %	
$\Gamma_7 \Upsilon(1S) \pi^0 \pi^0$	(2.20 ± 0.13) %	
$\Gamma_8 \Upsilon(1S) \eta$	< 1 × 10 ⁻⁴	CL=90%
$\Gamma_9 \Upsilon(1S) \pi^0$	< 7 × 10 ⁻⁵	CL=90%
$\Gamma_{10} h_b(1P) \pi^0$	< 1.2 × 10 ⁻³	CL=90%
$\Gamma_{11} h_b(1P) \pi^0 \rightarrow \gamma \eta_b(1S) \pi^0$	(4.3 ± 1.4) × 10 ⁻⁴	
$\Gamma_{12} h_b(1P) \pi^+ \pi^-$	< 1.2 × 10 ⁻⁴	CL=90%
$\Gamma_{13} \tau^+ \tau^-$	(2.29 ± 0.30) %	
$\Gamma_{14} \mu^+ \mu^-$	(2.18 ± 0.21) %	S=2.1
$\Gamma_{15} e^+ e^-$	seen	
Γ_{16} hadrons		
$\Gamma_{17} g g g$	(35.7 ± 2.6) %	
$\Gamma_{18} \gamma g g$	(9.7 ± 1.8) × 10 ⁻³	

Radiative decays

$\Gamma_{19} \gamma \chi_{b2}(2P)$	(13.1 ± 1.6) %	S=3.4
$\Gamma_{20} \gamma \chi_{b1}(2P)$	(12.6 ± 1.2) %	S=2.4
$\Gamma_{21} \gamma \chi_{b0}(2P)$	(5.9 ± 0.6) %	S=1.4
$\Gamma_{22} \gamma \chi_{b2}(1P)$	(9.9 ± 1.3) × 10 ⁻³	S=2.0
$\Gamma_{23} \gamma A^0 \rightarrow \gamma$ hadrons	< 8 × 10 ⁻⁵	CL=90%
$\Gamma_{24} \gamma \chi_{b1}(1P)$	(9 ± 5) × 10 ⁻⁴	S=1.9
$\Gamma_{25} \gamma \chi_{b0}(1P)$	(2.7 ± 0.4) × 10 ⁻³	
$\Gamma_{26} \gamma \eta_b(2S)$	< 6.2 × 10 ⁻⁴	CL=90%
$\Gamma_{27} \gamma \eta_b(1S)$	(5.1 ± 0.7) × 10 ⁻⁴	
$\Gamma_{28} \gamma X \rightarrow \gamma + \geq 4$ prongs	[a] < 2.2 × 10 ⁻⁴	CL=95%
$\Gamma_{29} \gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	< 5.5 × 10 ⁻⁶	CL=90%
$\Gamma_{30} \gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-$	[b] < 1.6 × 10 ⁻⁴	CL=90%

NODE=M048;CLUMP=B

DESIG=5

DESIG=6

DESIG=7

DESIG=103

DESIG=115

DESIG=104

DESIG=13

DESIG=14

DESIG=15

DESIG=102

DESIG=116

DESIG=108

Lepton Family number (*LF*) violating modes

Γ_{31}	$e^\pm \tau^\mp$	<i>LF</i>	< 4.2	$\times 10^{-6}$	CL=90%
Γ_{32}	$\mu^\pm \tau^\mp$	<i>LF</i>	< 3.1	$\times 10^{-6}$	CL=90%

[a] $1.5 \text{ GeV} < m_X < 5.0 \text{ GeV}$ [b] For $m_{\tau^+ \tau^-}$ in the ranges 4.03–9.52 and 9.61–10.10 GeV. **$\Upsilon(3S) \Gamma(i)\Gamma(e^+ e^-)/\Gamma(\text{total})$** **$\Gamma(\text{hadrons}) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$**

VALUE (keV)	DOCUMENT ID	TECN	COMMENT	$\Gamma_{16}\Gamma_{15}/\Gamma$
0.414±0.007 OUR AVERAGE				

$0.413 \pm 0.004 \pm 0.006$	ROSNER	06	CLEO	$10.4 e^+ e^- \rightarrow \text{hadrons}$
$0.45 \pm 0.03 \pm 0.03$	⁴ GILES	84B	CLEO	$e^+ e^- \rightarrow \text{hadrons}$

4 Radiative corrections reevaluated by BUCHMUELLER 88 following KURAEV 85.

 $\Gamma(\Upsilon(1S)\pi^+ \pi^-) \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	$\Gamma_6\Gamma_{15}/\Gamma$
18.46±0.27±0.77	6.4K	⁵ AUBERT	08BP BABR	$e^+ e^- \rightarrow \gamma\pi^+\pi^-\ell^+\ell^-$	

5 Using $B(\Upsilon(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$ and $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$. **$\Upsilon(3S) \text{ PARTIAL WIDTHS}$** **$\Gamma(e^+ e^-)$**

VALUE (keV)	DOCUMENT ID	Γ_{15}
0.443±0.008 OUR EVALUATION		

 $\Upsilon(3S) \text{ BRANCHING RATIOS}$ **$\Gamma(\Upsilon(2S)\text{anything})/\Gamma_{\text{total}}$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_1/Γ
0.106 ± 0.008 OUR AVERAGE					

0.1023 ± 0.0105	4625	6,7,8 BUTLER	94B CLE2	$e^+ e^- \rightarrow \ell^+\ell^-X$
0.111 ± 0.012	4891	7,8,9 BROCK	91 CLEO	$e^+ e^- \rightarrow \pi^+\pi^-X, \pi^+\pi^-\ell^+\ell^-$

6 Using $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\gamma\gamma) = (0.038 \pm 0.007)\%$, and $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^0\pi^0) = (1/2)B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-)$.7 Using $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.06)\%$. With the assumption of $e\mu$ universality.8 Using $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-) = (18.5 \pm 0.8)\%$.9 Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.31 \pm 0.21)\%$, $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\gamma\gamma) \times 2B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (0.188 \pm 0.035)\%$, and $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^0\pi^0) \times 2B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (0.436 \pm 0.056)\%$. With the assumption of $e\mu$ universality. **$\Gamma(\Upsilon(2S)\pi^+ \pi^-)/\Gamma_{\text{total}}$**

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_2/Γ
2.82±0.18 OUR AVERAGE				Error includes scale factor of 1.6. See the ideogram below.	

$3.00 \pm 0.02 \pm 0.14$	543k	LEES	11C BABR	$e^+ e^- \rightarrow \pi^+\pi^-X$
$2.40 \pm 0.10 \pm 0.26$	800	¹⁰ AUBERT	08BP BABR	$e^+ e^- \rightarrow \gamma\pi^+\pi^-e^+e^-$
3.12 ± 0.49	980	^{11,12} BUTLER	94B CLE2	$e^+ e^- \rightarrow \pi^+\pi^-\ell^+\ell^-$
2.13 ± 0.38	974	¹³ BROCK	91 CLEO	$e^+ e^- \rightarrow \pi^+\pi^-X, \pi^+\pi^-\ell^+\ell^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$4.82 \pm 0.65 \pm 0.53$	138	¹³ WU	93 CUSB	$\Upsilon(3S) \rightarrow \pi^+\pi^-\ell^+\ell^-$
3.1 ± 2.0	5	MAGERAS	82 CUSB	$\Upsilon(3S) \rightarrow \pi^+\pi^-\ell^+\ell^-$

10 Using $B(\Upsilon(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$, $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$, and $\Gamma_{ee}(\Upsilon(3S)) = 0.443 \pm 0.008 \text{ keV}$.

11 From the exclusive mode.

12 Using $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\gamma\gamma) = (0.038 \pm 0.007)\%$, and $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^0\pi^0) = (1/2)B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^-)$.13 Using $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.31 \pm 0.21)\%$, $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\gamma\gamma) \times 2B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (0.188 \pm 0.035)\%$, and $B(\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^0\pi^0) \times 2B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (0.436 \pm 0.056)\%$. With the assumption of $e\mu$ universality.

NODE=M048;CLUMP=C

DESIG=111

DESIG=105

LINKAGE=C48

LINKAGE=MRG

NODE=M048218

NODE=M048G2

NODE=M048G2

NODE=M048G2;LINKAGE=R

NODE=M048G01

NODE=M048G01

NODE=M048G01;LINKAGE=AU

NODE=M048220

NODE=M048W2

NODE=M048W2

→ UNCHECKED ←

NODE=M048225

NODE=M048R8

NODE=M048R8

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NODE=M048R;LINKAGE=B

NODE=M048R;LINKAGE=D

NODE=M048R;LINKAGE=C

NODE=M048R4

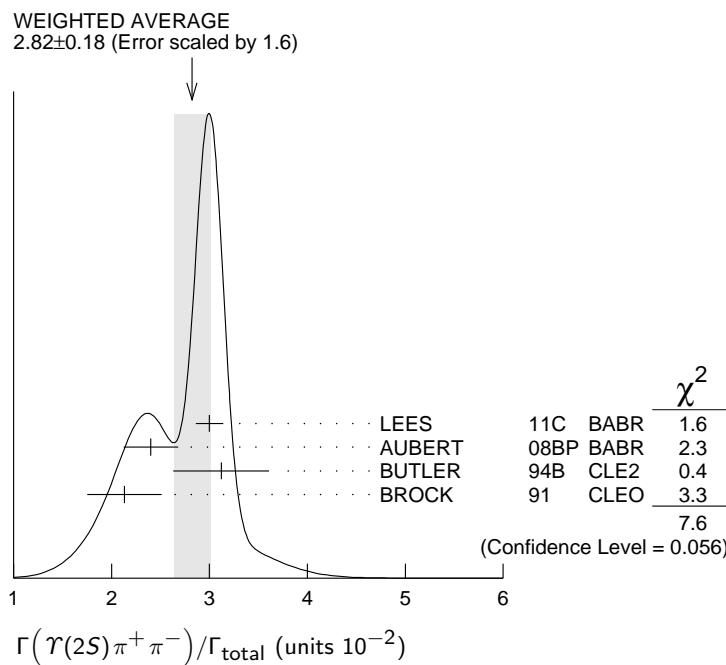
NODE=M048R4

NODE=M048R4;LINKAGE=AU

NODE=M048R;LINKAGE=M

NODE=M048R4;LINKAGE=A

NODE=M048R4;LINKAGE=C

 **$\Gamma(\gamma(2S)\pi^0\pi^0)/\Gamma_{\text{total}}$**

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.85 ± 0.14 OUR AVERAGE				
1.82±0.09±0.12	4391	14 BHARI	09 CLEO	$e^+e^- \rightarrow \pi^0\pi^0\ell^+\ell^-$
2.16±0.39		15,16 BUTLER	94B CLE2	$e^+e^- \rightarrow \pi^0\pi^0\ell^+\ell^-$
1.7 ± 0.5 ± 0.2	10	17 HEINTZ	92 CSB2	$e^+e^- \rightarrow \pi^0\pi^0\ell^+\ell^-$

14 Authors assume $B(\gamma(1S) \rightarrow e^+e^-) + B(\gamma(1S) \rightarrow \mu^+\mu^-) = 4.06\%$.15 $B(\gamma(2S) \rightarrow \mu^+\mu^-) = (1.31 \pm 0.21)\%$ and assuming $e\mu$ universality.

16 From the exclusive mode.

17 $B(\gamma(2S) \rightarrow \mu^+\mu^-) = (1.44 \pm 0.10)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91. **Γ_3/Γ** NODE=M048R10
NODE=M048R10 **$\Gamma(\gamma(2S)\gamma\gamma)/\Gamma_{\text{total}}$**

VALUE	DOCUMENT ID	TECN	COMMENT
0.0502 ± 0.0069			

18 From the exclusive mode.

 Γ_4/Γ NODE=M048R10;LINKAGE=BH
NODE=M048R;LINKAGE=K
NODE=M048R10;LINKAGE=M
NODE=M048R;LINKAGE=G **$\Gamma(\gamma(2S)\pi^0)/\Gamma_{\text{total}}$**

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<0.51	90	19 HE	08A CLEO	$e^+e^- \rightarrow \ell^+\ell^-\gamma\gamma$

19 Authors assume $B(\gamma(2S) \rightarrow e^+e^-) + B(\gamma(1S) \rightarrow \mu^+\mu^-) = 4.06\%$. **Γ_5/Γ** NODE=M048R25
NODE=M048R25 **$\Gamma(\gamma(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$** **$\Gamma_6/\Gamma$**

NODE=M048R25;LINKAGE=HE

Abbreviation MM in the COMMENT field below stands for missing mass.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
4.37 ± 0.08 OUR AVERAGE				

4.32±0.07±0.13	90k	20 LEES	11L BABR	$\gamma(3S) \rightarrow \pi^+\pi^-\ell^+\ell^-$
4.46±0.01±0.13	190k	21 BHARI	09 CLEO	$e^+e^- \rightarrow \pi^+\pi^-$ MM
4.17±0.06±0.19	6.4K	22 AUBERT	08BP BABR	$10.58 e^+e^- \rightarrow \gamma\pi^+\pi^-\ell^+\ell^-$
4.52±0.35	11830	23 BUTLER	94B CLE2	$e^+e^- \rightarrow \pi^+\pi^- X, \pi^+\pi^-\ell^+\ell^-$
4.46±0.34±0.50	451	23 WU	93 CUSB	$\gamma(3S) \rightarrow \pi^+\pi^-\ell^+\ell^-$
4.46±0.30	11221	23 BROCK	91 CLEO	$e^+e^- \rightarrow \pi^+\pi^- X, \pi^+\pi^-\ell^+\ell^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

4.9 ± 1.0	22	GREEN	82 CLEO	$\gamma(3S) \rightarrow \pi^+\pi^-\ell^+\ell^-$
3.9 ± 1.3	26	MAGERAS	82 CUSB	$\gamma(3S) \rightarrow \pi^+\pi^-\ell^+\ell^-$

20 Using $B(\gamma(1S) \rightarrow e^+e^-) = (2.38 \pm 0.11)\%$ and $B(\gamma(1S) \rightarrow \mu^+\mu^-) = (2.48 \pm 0.05)\%$.

21 A weighted average of the inclusive and exclusive results.

22 Using $B(\gamma(2S) \rightarrow e^+e^-) = (1.91 \pm 0.16)\%$, $B(\gamma(2S) \rightarrow \mu^+\mu^-) = (1.93 \pm 0.17)\%$, and $\Gamma_{ee}(\gamma(3S)) = 0.443 \pm 0.008$ keV.23 Using $B(\gamma(1S) \rightarrow \mu^+\mu^-) = (2.48 \pm 0.06)\%$. With the assumption of $e\mu$ universality.

NODE=M048R3;LINKAGE=LE

NODE=M048R3;LINKAGE=BH

NODE=M048R3;LINKAGE=AU

NODE=M048R3;LINKAGE=B

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.577 \pm 0.026 \pm 0.060	800	²⁴ AUBERT	08BP BABR	$e^+e^- \rightarrow \gamma\pi^+\pi^-\ell^+\ell^-$
24 Using $B(\Upsilon(1S) \rightarrow e^+e^-) = (2.38 \pm 0.11)\%$, $B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = (2.48 \pm 0.05)\%$, $B(\Upsilon(2S) \rightarrow e^+e^-) = (1.91 \pm 0.16)\%$, and $B(\Upsilon(2S) \rightarrow \mu^+\mu^-) = (1.93 \pm 0.17)\%$. Not independent of other values reported by AUBERT 08BP.				

 Γ_2/Γ_6

NODE=M048R28
NODE=M048R28

 $\Gamma(\Upsilon(1S)\pi^0\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.20 \pm 0.13 OUR AVERAGE				
2.24 \pm 0.09 \pm 0.11	6584	²⁵ BHARI	09	CLEO $e^+e^- \rightarrow \pi^0\pi^0\ell^+\ell^-$
1.99 \pm 0.34	56	²⁶ BUTLER	94B	CLE2 $e^+e^- \rightarrow \pi^0\pi^0\ell^+\ell^-$
2.2 \pm 0.4 \pm 0.3	33	²⁷ HEINTZ	92	CSB2 $e^+e^- \rightarrow \pi^0\pi^0\ell^+\ell^-$
25 Authors assume $B(\Upsilon(1S) \rightarrow e^+e^-) + B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = 4.96\%$.				
26 Using $B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = (2.48 \pm 0.06)\%$ and assuming $e\mu$ universality.				
27 Using $B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = (2.57 \pm 0.07)\%$ and assuming $e\mu$ universality. Supersedes HEINTZ 91.				

 Γ_7/Γ

NODE=M048R11
NODE=M048R11

 $\Gamma(\Upsilon(1S)\pi^0\pi^0)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.501 \pm 0.043	²⁸ BHARI	09	CLEO $e^+e^- \rightarrow \Upsilon(3S)$
28 Not independent of other values reported by BHARI 09.			

 Γ_7/Γ_6

NODE=M048R26
NODE=M048R26

 $\Gamma(\Upsilon(1S)\eta)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<0.1	90	²⁹ LEES	11L	BABR $\Upsilon(3S) \rightarrow (\pi^+\pi^-)(\gamma\gamma)\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.8	90	^{29,30} AUBERT	08BP BABR	$e^+e^- \rightarrow \gamma\pi^+\pi^-\pi^0\ell^+\ell^-$
<0.18	90	³¹ HE	08A	CLEO $e^+e^- \rightarrow \ell^+\ell^-\eta$
<2.2	90	BROCK	91	CLEO $e^+e^- \rightarrow \ell^+\ell^-\eta$
29 Using $B(\Upsilon(1S) \rightarrow e^+e^-) = (2.38 \pm 0.11)\%$, $B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = (2.48 \pm 0.05)\%$.				
30 Using $\Gamma_{ee}(\Upsilon(3S)) = 0.443 \pm 0.008$ keV.				
31 Authors assume $B(\Upsilon(1S) \rightarrow e^+e^-) + B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = 4.96\%$.				

 Γ_8/Γ

NODE=M048R9
NODE=M048R9

 $\Gamma(\Upsilon(1S)\eta)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
<0.23	90	³² LEES	11L	BABR $\Upsilon(3S) \rightarrow (\pi^+\pi^-)(\gamma\gamma)\ell^+\ell^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1.9	90	³³ AUBERT	08BP BABR	$e^+e^- \rightarrow \gamma\pi^+\pi^-(\pi^0)\ell^+\ell^-$
32 Not independent of other values reported by LEES 11L.				
33 Not independent of other values reported by AUBERT 08BP.				

 Γ_8/Γ_6

NODE=M048R27
NODE=M048R27

 $\Gamma(\Upsilon(1S)\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<0.07	90	³⁴ HE	08A	CLEO $e^+e^- \rightarrow \ell^+\ell^-\gamma\gamma$
34 Authors assume $B(\Upsilon(1S) \rightarrow e^+e^-) + B(\Upsilon(1S) \rightarrow \mu^+\mu^-) = 4.96\%$.				

 Γ_9/Γ

NODE=M048R24
NODE=M048R24

 $\Gamma(h_b(1P)\pi^0)/\Gamma_{\text{total}}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.2 \times 10 ⁻³	90	³⁵ GE	11	CLEO $\Upsilon(3S) \rightarrow \pi^0$ anything
35 Assuming $M(h_b(1P)) = 9900$ MeV and $\Gamma(h_b(1P)) = 0$ MeV, and allowing $B(h_b(1P) \rightarrow \gamma\eta_b(1S))$ to vary from 0–100%.				

 Γ_{10}/Γ

NODE=M048R03
NODE=M048R03

 $\Gamma(h_b(1P)\pi^0 \rightarrow \gamma\eta_b(1S)\pi^0)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
4.3 \pm 1.1 \pm 0.9	LEES	11K	BABR $\Upsilon(3S) \rightarrow \eta_b\gamma\pi^0$

 Γ_{11}/Γ

NODE=M048R33
NODE=M048R33

$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{12}/Γ
< 1.2	90	36 LEES	11C BABR	$e^+ e^- \rightarrow \pi^+ \pi^- X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<18		36 BUTLER	94B CLE2	$e^+ e^- \rightarrow \pi^+ \pi^- X$	
<15		36 BROCK	91 CLEO	$e^+ e^- \rightarrow \pi^+ \pi^- X$	
36 For $M(h_b(1P)) = 9900$ MeV.					

NODE=M048R34
NODE=M048R34 $\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ
2.29±0.21±0.22	15k	37 BESSON	07 CLEO	$e^+ e^- \rightarrow \gamma(3S) \rightarrow \tau^+ \tau^-$	
37 BESSON 07 reports $[\Gamma(\gamma(3S) \rightarrow \tau^+ \tau^-)/\Gamma_{\text{total}}] / [B(\gamma(3S) \rightarrow \mu^+ \mu^-)] = 1.05 \pm 0.08 \pm 0.05$ which we multiply by our best value $B(\gamma(3S) \rightarrow \mu^+ \mu^-) = (2.18 \pm 0.21) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.					

NODE=M048R34;LINKAGE=MH

 $\Gamma(\tau^+\tau^-)/\Gamma(\mu^+\mu^-)$

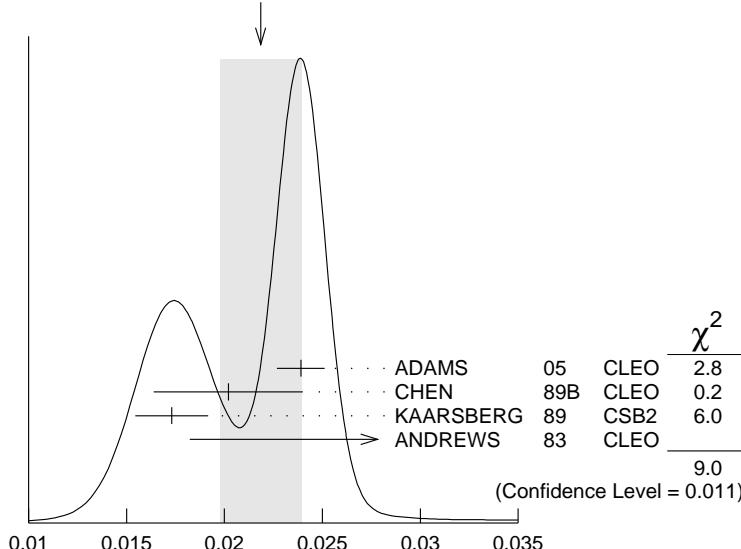
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{13}/Γ_{14}
1.05±0.08±0.05	15k	BESSON	07 CLEO	$e^+ e^- \rightarrow \gamma(3S)$	

NODE=M048R18
NODE=M048R18

NODE=M048R18;LINKAGE=BE

 $\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{14}/Γ
0.0218±0.0021 OUR AVERAGE		Error includes scale factor of 2.1. See the ideogram below.			
0.0239±0.0007±0.0010	81k	ADAMS	05 CLEO	$e^+ e^- \rightarrow \mu^+ \mu^-$	
0.0202±0.0019±0.0033		CHEN	89B CLEO	$e^+ e^- \rightarrow \mu^+ \mu^-$	
0.0173±0.0015±0.0011		KAARSBERG	89 CSB2	$e^+ e^- \rightarrow \mu^+ \mu^-$	
0.033 ± 0.013 ± 0.007	1096	ANDREWS	83 CLEO	$e^+ e^- \rightarrow \mu^+ \mu^-$	

NODE=M048R19
NODE=M048R19WEIGHTED AVERAGE
 0.0218 ± 0.0021 (Error scaled by 2.1) $\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{17}/Γ
35.7±2.6	3M	38 BESSON	06A CLEO	$\gamma(3S) \rightarrow \text{hadrons}$	

NODE=M048R30
NODE=M048R30

38 Calculated using BESSON 06A value of $\Gamma(\gamma gg)/\Gamma(gg) = (2.72 \pm 0.06 \pm 0.32 \pm 0.37)\%$ and the PDG 08 values of $B(\gamma(2S) + \text{anything}) = (10.6 \pm 0.8)\%$, $B(\pi^+\pi^- \gamma(1S)) = (4.40 \pm 0.10)\%$, $B(\pi^0\pi^0 \gamma(1S)) = (2.20 \pm 0.13)\%$, $B(\gamma\chi_{b2}(2P)) = (13.1 \pm 1.6)\%$, $B(\gamma\chi_{b1}(2P)) = (12.6 \pm 1.2)\%$, $B(\gamma\chi_{b0}(2P)) = (5.9 \pm 0.6)\%$, $B(\gamma\chi_{b0}(1P)) = (0.30 \pm 0.11)\%$, $B(\mu^+\mu^-) = (2.18 \pm 0.21)\%$, and $R_{\text{hadrons}} = 3.51$. The statistical error is negligible and the systematic error is partially correlated with $\Gamma(\gamma gg)/\Gamma_{\text{total}}$ BESSON 06A value.

NODE=M048R30;LINKAGE=BE

$\Gamma(\gamma gg)/\Gamma_{\text{total}}$

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{18}/Γ
0.97±0.18	60k	39 BESSON	06A CLEO	$\Gamma(3S) \rightarrow \gamma + \text{hadrons}$	

39 Calculated using BESSON 06A values of $\Gamma(\gamma gg)/\Gamma(ggg) = (2.72 \pm 0.06 \pm 0.32 \pm 0.37)\%$ and $\Gamma(ggg)/\Gamma_{\text{total}}$. The statistical error is negligible and the systematic error is partially correlated with $\Gamma(ggg)/\Gamma_{\text{total}}$ BESSON 06A value.

 $\Gamma(\gamma gg)/\Gamma(ggg)$

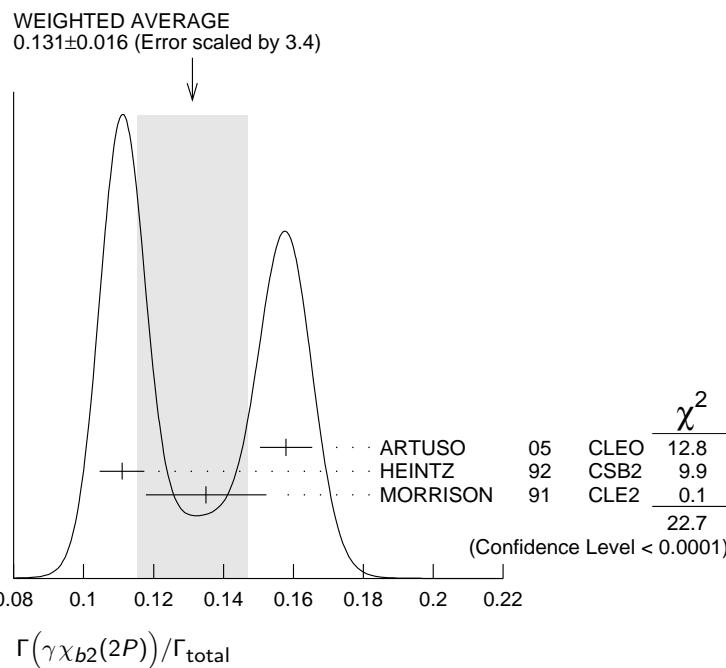
VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{18}/Γ_{17}
2.72±0.06±0.49	3M	BESSON	06A CLEO	$\Gamma(3S) \rightarrow (\gamma +) \text{hadrons}$	

 $\Gamma(\gamma \chi b_2(2P))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{19}/Γ
0.131 ±0.016 OUR AVERAGE				Error includes scale factor of 3.4. See the ideogram below.	

0.1579±0.0017±0.0073	568k	ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$
0.111 ±0.005 ±0.004	10319	⁴⁰ HEINTZ	92 CSB2	$e^+ e^- \rightarrow \gamma X$
0.135 ±0.003 ±0.017	30741	MORRISON	91 CLE2	$e^+ e^- \rightarrow \gamma X$

40 Supersedes NARAIN 91.

 $\Gamma(\gamma \chi b_1(2P))/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{20}/Γ
0.126 ±0.012 OUR AVERAGE				Error includes scale factor of 2.4. See the ideogram below.	

0.1454±0.0018±0.0073	537k	ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$
0.115 ±0.005 ±0.005	11147	⁴¹ HEINTZ	92 CSB2	$e^+ e^- \rightarrow \gamma X$
0.105 ^{+0.003} _{-0.002} ±0.013	25759	MORRISON	91 CLE2	$e^+ e^- \rightarrow \gamma X$

41 Supersedes NARAIN 91.

NODE=M048R31
NODE=M048R31

NODE=M048R31;LINKAGE=BE

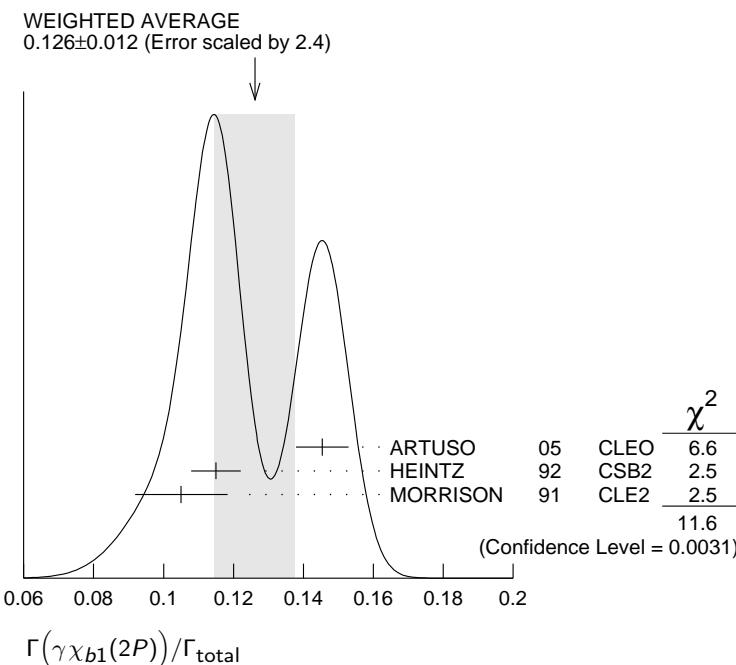
NODE=M048R32
NODE=M048R32

NODE=M048R5
NODE=M048R5

NODE=M048R;LINKAGE=H

NODE=M048R6
NODE=M048R6

NODE=M048R6;LINKAGE=H

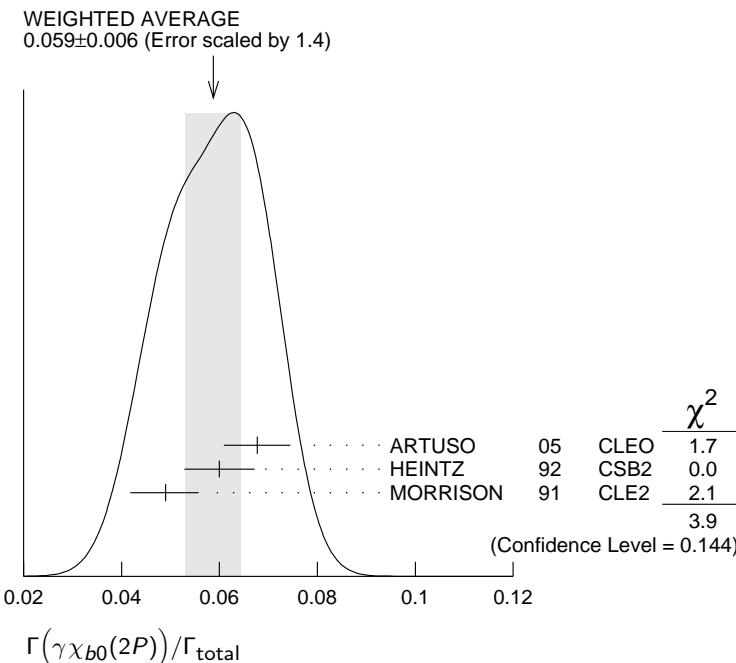


VALUE	EVTS	DOCUMENT ID	TECN	Γ_{21}/Γ
0.059 ± 0.006 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.		
0.0677 ± 0.0020 ± 0.0065	225k	ARTUSO	05	CLEO $e^+e^- \rightarrow \gamma X$
0.060 ± 0.004 ± 0.006	4959	42 HEINTZ	92	CSB2 $e^+e^- \rightarrow \gamma X$
0.049 +0.003 -0.004 ± 0.006	9903	MORRISON	91	CLE2 $e^+e^- \rightarrow \gamma X$

42 Supersedes NARAIN 91.

NODE=M048R7
NODE=M048R7

NODE=M048R7;LINKAGE=H



VALUE (units 10^{-3})	CL %	EVTS	DOCUMENT ID	TECN	Γ_{22}/Γ
9.9±1.3 OUR AVERAGE			Error includes scale factor of 2.0.		
7.5±1.2±0.5	126	43,44 KORNICER	11	CLEO $e^+e^- \rightarrow \gamma\gamma\ell^+\ell^-$	
10.5±0.3 +0.7 -0.6	9.7k	LEES	11J	BABR $\gamma(3S) \rightarrow X\gamma$	

NODE=M048R21
NODE=M048R21

• • • We do not use the following data for averages, fits, limits, etc. • • •

<19 seen	90	45 ASNER	08A CLEO	$\gamma(3S) \rightarrow \gamma + \text{hadrons}$
		46 HEINTZ	92 CSB2	$e^+e^- \rightarrow \gamma\gamma\ell^+\ell^-$

43 Assuming $B(\Upsilon(1S) \rightarrow \ell^+ \ell^-) = (2.48 \pm 0.05)\%$.

44 KORNICER 11 reports $[\Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(1P)) / \Gamma_{\text{total}}] \times [B(\chi_{b2}(1P) \rightarrow \gamma \Upsilon(1S))] = (1.435 \pm 0.162 \pm 0.169) \times 10^{-3}$ which we divide by our best value $B(\chi_{b2}(1P) \rightarrow \gamma \Upsilon(1S)) = (19.1 \pm 1.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

45 ASNER 08A reports $[\Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b2}(1P)) / \Gamma_{\text{total}}] / [B(\Upsilon(2S) \rightarrow \gamma \chi_{b2}(1P))] < 27.1 \times 10^{-2}$ which we multiply by our best value $B(\Upsilon(2S) \rightarrow \gamma \chi_{b2}(1P)) = 7.15 \times 10^{-2}$.

46 HEINTZ 92, while unable to distinguish between different J states, measures $\sum_J B(\Upsilon(3S) \rightarrow \gamma \chi_{bJ}) \times B(\chi_{bJ} \rightarrow \gamma \Upsilon(1S)) = (1.7 \pm 0.4 \pm 0.6) \times 10^{-3}$ for $J = 0,1,2$ using inclusive $\Upsilon(1S)$ decays and $(1.2^{+0.4}_{-0.3} \pm 0.09) \times 10^{-3}$ for $J = 1,2$ using $\Upsilon(1S) \rightarrow \ell^+ \ell^-$.

$\Gamma(\gamma \chi_{b1}(1P)) / \Gamma_{\text{total}}$

Γ_{24}/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.9\pm0.5 OUR AVERAGE					Error includes scale factor of 1.9.
1.6 \pm 0.5 \pm 0.1		50	47,48 KORNICER	11 CLEO	$e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$
0.5 \pm 0.3 $^{+0.2}_{-0.1}$			LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<1.7	90	49 ASNER seen	08A CLEO	$\Upsilon(3S) \rightarrow \gamma + \text{hadrons}$
		50 HEINTZ	92 CSB2	$e^+ e^- \rightarrow \gamma\gamma \ell^+ \ell^-$

47 Assuming $B(\Upsilon(1S) \rightarrow \ell^+ \ell^-) = (2.48 \pm 0.05)\%$.

48 KORNICER 11 reports $[\Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(1P)) / \Gamma_{\text{total}}] \times [B(\chi_{b1}(1P) \rightarrow \gamma \Upsilon(1S))] = (5.38 \pm 1.20 \pm 0.95) \times 10^{-4}$ which we divide by our best value $B(\chi_{b1}(1P) \rightarrow \gamma \Upsilon(1S)) = (33.9 \pm 2.2) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

49 ASNER 08A reports $[\Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b1}(1P)) / \Gamma_{\text{total}}] / [B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P))] < 2.5 \times 10^{-2}$ which we multiply by our best value $B(\Upsilon(2S) \rightarrow \gamma \chi_{b1}(1P)) = 6.9 \times 10^{-2}$.

50 HEINTZ 92, while unable to distinguish between different J states, measures $\sum_J B(\Upsilon(3S) \rightarrow \gamma \chi_{bJ}) \times B(\chi_{bJ} \rightarrow \gamma \Upsilon(1S)) = (1.7 \pm 0.4 \pm 0.6) \times 10^{-3}$ for $J = 0,1,2$ using inclusive $\Upsilon(1S)$ decays and $(1.2^{+0.4}_{-0.3} \pm 0.09) \times 10^{-3}$ for $J = 1,2$ using $\Upsilon(1S) \rightarrow \ell^+ \ell^-$.

$\Gamma(\gamma \chi_{b0}(1P)) / \Gamma_{\text{total}}$

Γ_{25}/Γ

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.27\pm0.04 OUR AVERAGE					
0.27 \pm 0.04 \pm 0.02		2.3k LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$	
0.30 \pm 0.04 \pm 0.10		8.7k ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.8	90	51 ASNER	08A CLEO	$\Upsilon(3S) \rightarrow \gamma + \text{hadrons}$
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51 ASNER 08A reports $[\Gamma(\Upsilon(3S) \rightarrow \gamma \chi_{b0}(1P)) / \Gamma_{\text{total}}] / [B(\Upsilon(2S) \rightarrow \gamma \chi_{b0}(1P))] < 21.9 \times 10^{-2}$ which we multiply by our best value $B(\Upsilon(2S) \rightarrow \gamma \chi_{b0}(1P)) = 3.8 \times 10^{-2}$.

$\Gamma(\gamma \eta_b(2S)) / \Gamma_{\text{total}}$

Γ_{26}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
< 6.2	90	ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					

<19 90 LEES 11J BABR $\Upsilon(3S) \rightarrow X\gamma$

$\Gamma(\gamma \eta_b(1S)) / \Gamma_{\text{total}}$

Γ_{27}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
5.1\pm0.7 OUR AVERAGE					
7.1 \pm 1.8 \pm 1.3		2.3 \pm 0.5k 52 BONVICINI	10 CLEO	$\Upsilon(3S) \rightarrow \gamma X$	
4.8 \pm 0.5 \pm 0.6		19 \pm 3k 52 AUBERT	09AQ BABR	$\Upsilon(3S) \rightarrow \gamma X$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

<8.5	90	LEES	11J BABR	$\Upsilon(3S) \rightarrow X\gamma$
4.8 \pm 0.5 \pm 1.2		19 \pm 3k 52,53 AUBERT	08V BABR	$\Upsilon(3S) \rightarrow \gamma X$
<4.3	90	54 ARTUSO	05 CLEO	$e^+ e^- \rightarrow \gamma X$

52 Assuming $\Gamma_{\eta_b(1S)} = 10$ MeV.

53 Systematic error re-evaluated by AUBERT 09AQ.

54 Superseded by BONVICINI 10.

NODE=M048R21;LINKAGE=KA
NODE=M048R21;LINKAGE=KR

NODE=M048R21;LINKAGE=AS

NODE=M048R21;LINKAGE=HE

NODE=M048R22
NODE=M048R22

NODE=M048R22;LINKAGE=KA
NODE=M048R22;LINKAGE=KR

NODE=M048R22;LINKAGE=AS

NODE=M048R22;LINKAGE=HE

NODE=M048R15
NODE=M048R15

NODE=M048R15;LINKAGE=AS

NODE=M048R16
NODE=M048R16

NODE=M048R17
NODE=M048R17

NODE=M048R17;LINKAGE=BO
NODE=M048R17;LINKAGE=AU
NODE=M048R17;LINKAGE=SU

$\Gamma(\gamma X \rightarrow \gamma + \geq 4 \text{ prongs})/\Gamma_{\text{total}}$					Γ_{28}/Γ
(1.5 GeV < m_X < 5.0 GeV)					NODE=M048R20
VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT	NODE=M048R20
<2.2	95	ROSNER	07A	CLEO $e^+ e^- \rightarrow \gamma X$	NODE=M048R20
$\Gamma(\gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-)/\Gamma_{\text{total}}$					Γ_{29}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	NODE=M048R04
<5.5	90	55 AUBERT	09Z	BABR $e^+ e^- \rightarrow \gamma a_1^0 \rightarrow \gamma \mu^+ \mu^-$	NODE=M048R04
55 For a narrow scalar or pseudoscalar a_1^0 with mass in the range 212–9300 MeV, excluding J/ψ and $\psi(2S)$. Measured 90% CL limits as a function of $m_{a_1^0}$ range from $0.27\text{--}5.5 \times 10^{-6}$.					NODE=M048R04;LINKAGE=AU
$\Gamma(\gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-)/\Gamma_{\text{total}}$					Γ_{30}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	NODE=M048R29
$<1.6 \times 10^{-4}$	90	56 AUBERT	09P	BABR $e^+ e^- \rightarrow \gamma a_1^0 \rightarrow \gamma \tau^+ \tau^-$	NODE=M048R29
56 For a narrow scalar or pseudoscalar a_1^0 with $M(\tau^+ \tau^-)$ in the ranges 4.03–9.52 and 9.61–10.10 GeV. Measured 90% CL limits as a function of $M(\tau^+ \tau^-)$ range from $1.5\text{--}16 \times 10^{-5}$.					NODE=M048R29;LINKAGE=AU
$\Gamma(\gamma A^0 \rightarrow \gamma \text{ hadrons})/\Gamma_{\text{total}}$					Γ_{23}/Γ
(0.3 GeV < m_{A^0} < 7 GeV)					NODE=M048R02
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	NODE=M048R02
$<8 \times 10^{-5}$	90	57 LEES	11H	BABR $\gamma(3S) \rightarrow \gamma \text{ hadrons}$	NODE=M048R02
57 For a narrow scalar or pseudoscalar A^0 , excluding known resonances, with mass in the range 0.3–7 GeV. Measured 90% CL limits as a function of m_{A^0} range from 1×10^{-6} to 8×10^{-5} .					NODE=M048R02;LINKAGE=LE
LEPTON FAMILY NUMBER (LF) VIOLATING MODES					
$\Gamma(e^\pm \tau^\mp)/\Gamma_{\text{total}}$					Γ_{31}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	NODE=M048R01
<4.2	90	LEES	10B	BABR $e^+ e^- \rightarrow e^\pm \tau^\mp$	NODE=M048R01
$\Gamma(\mu^\pm \tau^\mp)/\Gamma_{\text{total}}$					Γ_{32}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	NODE=M048R23
< 3.1	90	LEES	10B	BABR $e^+ e^- \rightarrow \mu^\pm \tau^\mp$	NODE=M048R23
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<20.3	95	LOVE	08A	CLEO $e^+ e^- \rightarrow \mu^\pm \tau^\mp$	

Γ(3S) REFERENCES

GE	11	PR D84 032008	J.Y. Ge <i>et al.</i>	(CLEO Collab.)	REFID=53960
KORNICER	11	PR D83 054003	M. Kornicer <i>et al.</i>	(CLEO Collab.)	REFID=16769
LEES	11C	PR D84 011104	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=16775
LEES	11H	PRL 107 221803	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53877
LEES	11J	PR D84 072002	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53936
LEES	11K	PR D84 091101	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53937
LEES	11L	PR D84 092003	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53938
BONVICINI	10	PR D81 031104	G. Bonvicini <i>et al.</i>	(CLEO Collab.)	REFID=53231
LEES	10B	PRL 104 151802	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=53355
AUBERT	09AQ	PRL 103 161801	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=53106
AUBERT	09P	PRL 103 181801	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=53062
AUBERT	09Z	PRL 103 081803	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52930
BHARI	09	PR D79 011103	S.R. Bhari <i>et al.</i>	(CLEO Collab.)	REFID=52662
ASNER	08A	PR D78 091103	D.M. Asner <i>et al.</i>	(CLEO Collab.)	REFID=52574
AUBERT	08BP	PR D78 112002	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52660
AUBERT	08V	PRL 101 071801	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52262
HE	08A	PRL 101 192001	Q. He <i>et al.</i>	(CLEO Collab.)	REFID=52587
LOVE	08A	PRL 101 201601	W. Love <i>et al.</i>	(CLEO Collab.)	REFID=52592
PDG	08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)	REFID=52166
BESSON	07	PR D79 052002	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=51620
ROSNER	07A	PR D76 117102	J.L. Rosner <i>et al.</i>	(CLEO Collab.)	REFID=52079
BESSION	06A	PR D74 012003	D. Besson <i>et al.</i>	(CLEO Collab.)	REFID=51147
ROSNER	06	PRL 96 092003	J.L. Rosner <i>et al.</i>	(CLEO Collab.)	REFID=51035
ADAMS	05	PRL 94 012001	G.S. Adams <i>et al.</i>	(CLEO Collab.)	REFID=50452
ARTUSO	05	PRL 94 032001	M. Artuso <i>et al.</i>	(CLEO Collab.)	REFID=50454
ARTAMONOV	00	PL B474 427	A.S. Artamonov <i>et al.</i>	(CLEO Collab.)	REFID=47424
BUTLER	94B	PR D49 40	F. Butler <i>et al.</i>	(CLEO Collab.)	REFID=43799

WU	93	PL B301 307	Q.W. Wu <i>et al.</i>	(CUSB Collab.)	REFID=43313
HEINTZ	92	PR D46 1928	U. Heintz <i>et al.</i>	(CUSB II Collab.)	REFID=43604
BROCK	91	PR D43 1448	I.C. Brock <i>et al.</i>	(CLEO Collab.)	REFID=41579
HEINTZ	91	PRL 66 1563	U. Heintz <i>et al.</i>	(CUSB Collab.)	REFID=41580
MORRISON	91	PRL 67 1696	R.J. Morrison <i>et al.</i>	(CLEO Collab.)	REFID=41634
NARAIN	91	PRL 66 3113	M. Narain <i>et al.</i>	(CUSA Collab.)	REFID=41586
CHEN	89B	PR D39 3528	W.Y. Chen <i>et al.</i>	(CLEO Collab.)	REFID=40919
KAARSBERG	89	PRL 62 2077	T.M. Kaarsberg <i>et al.</i>	(CUSB Collab.)	REFID=40733
BUCHMUELLER...	88	HE e ⁺ e ⁻ Physics 412	W. Buchmuller, S. Cooper Editors: A. Ali and P. Soeding, World Scientific, Singapore	(HANN, DESY, MIT)	REFID=40034
COHEN	87	RMP 59 1121	E.R. Cohen, B.N. Taylor	(RISC, NBS)	REFID=11616
BARU	86B	ZPHY C32 622 (erratum)	S.E. Baru <i>et al.</i>	(NOVO)	REFID=22338
KURAEV	85	SJNP 41 466	E.A. Kuraev, V.S. Fadin	(NOVO)	REFID=40033
		Translated from YAF 41 733.			
ARTAMONOV	84	PL 137B 272	A.S. Artamonov <i>et al.</i>	(NOVO)	REFID=22278
GILES	84B	PR D29 1285	R. Giles <i>et al.</i>	(CLEO Collab.)	REFID=22280
ANDREWS	83	PRL 50 807	D.E. Andrews <i>et al.</i>	(CLEO Collab.)	REFID=22273
GREEN	82	PRL 49 617	J. Green <i>et al.</i>	(CLEO Collab.)	REFID=22321
MAGERAS	82	PL 118B 453	G. Mageras <i>et al.</i>	(COLU, CORN, LSU+)	REFID=22359

$\chi_b(3P)$

$$\Gamma^G(J^{PC}) = ?(?^?)$$

A mixture of $J = 0, 1$, and 2 spin components observed in the radiative decay to $\Upsilon(1S)$ and $\Upsilon(2S)$, therefore $C = +$.

$\chi_b(3P)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
10534 ± 9 OUR AVERAGE			
[10.530 ± 0.010 GeV OUR 2012 AVERAGE]			
10530 ± 5 ± 9	¹ AAD	12A ATLS	$p p \rightarrow \gamma \mu^+ \mu^- X$
10551 ± 14 ± 17	¹ ABAZOV	12Q D0	$p \bar{p} \rightarrow \gamma \mu^+ \mu^- X$

¹The mass barycenter of the merged lineshapes from the $J = 1$ and 2 states.

$\chi_b(3P)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad \Upsilon(1S)\gamma$	seen
$\Gamma_2 \quad \Upsilon(2S)\gamma$	seen

$\chi_b(3P)$ BRANCHING RATIOS

$\Gamma(\Upsilon(1S)\gamma)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ_1/Γ
seen	AAD	12A ATLS	$p p \rightarrow \gamma \mu^+ \mu^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	ABAZOV	12Q D0	$p \bar{p} \rightarrow \gamma \mu^+ \mu^- X$

$\Gamma(\Upsilon(2S)\gamma)/\Gamma_{\text{total}}$	DOCUMENT ID	TECN	Γ_2/Γ
seen	AAD	12A ATLS	$p p \rightarrow \gamma \mu^+ \mu^- X$

$\chi_b(3P)$ REFERENCES			
AAD	12A	PRL 108 152001	G. Aad <i>et al.</i>
ABAZOV	12Q	PR D86 031103	V.M. Abazov <i>et al.</i>

NODE=M206

NODE=M206

NODE=M206M

NODE=M206M

NEW

NODE=M206M;LINKAGE=AA

NODE=M206215;NODE=M206

DESIG=1

DESIG=2

NODE=M206225

NODE=M206R01

NODE=M206R01

NODE=M206R02

NODE=M206R02

NODE=M206

REFID=54037

REFID=54264

$\Upsilon(4S)$
or $\Upsilon(10580)$

$I^G(J^{PC}) = 0^-(1^- -)$

$\Upsilon(4S)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
10579.4±1.2 OUR AVERAGE			
[10.5794 ± 0.0012 GeV OUR 2012 AVERAGE]			
10579.3±0.4±1.2	AUBERT 05Q	BABR	$e^+ e^- \rightarrow$ hadrons
10580.0±3.5	¹ BEBEK 87	CLEO	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •			
10577.4±1.0	² LOVELOCK 85	CUSB	$e^+ e^- \rightarrow$ hadrons

¹ Reanalysis of BESSON 85.

² No systematic error given.

NODE=M047M

NODE=M047M

NEW

NODE=M047M;LINKAGE=C

NODE=M047M;LINKAGE=B

NODE=M047W

NODE=M047W

$\Upsilon(4S)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
20.5±2.5 OUR AVERAGE			
20.7±1.6±2.5	AUBERT 05Q	BABR	$e^+ e^- \rightarrow$ hadrons
20 ± 2 ± 4	BESSON 85	CLEO	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •			
25 ± 2.5	LOVELOCK 85	CUSB	$e^+ e^- \rightarrow$ hadrons

$\Upsilon(4S)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Confidence level	
$\Gamma_1 B\bar{B}$	> 96 %	95%	
$\Gamma_2 B^+ B^-$	(51.3 ± 0.6) %		DESIG=8;OUR EST;→ UNCHECKED ←
$\Gamma_3 D^+_s$ anything + c.c.	(17.8 ± 2.6) %		DESIG=10
$\Gamma_4 B^0 \bar{B}^0$	(48.7 ± 0.6) %		DESIG=12
$\Gamma_5 J/\psi K_S^0 (J/\psi, \eta_c) K_S^0$	< 4 $\times 10^{-7}$	90%	DESIG=11
Γ_6 non- $B\bar{B}$	< 4 %	95%	DESIG=15
$\Gamma_7 e^+ e^-$	(1.57 ± 0.08) $\times 10^{-5}$		DESIG=6
$\Gamma_8 \rho^+ \rho^-$	< 5.7 $\times 10^{-6}$	90%	DESIG=1
$\Gamma_9 J/\psi(1S)$ anything	< 1.9 $\times 10^{-4}$	95%	DESIG=16
$\Gamma_{10} D^{*+}$ anything + c.c.	< 7.4 %	90%	DESIG=2
$\Gamma_{11} \phi$ anything	(7.1 ± 0.6) %		DESIG=3
$\Gamma_{12} \phi \eta$	< 1.8 $\times 10^{-6}$	90%	DESIG=4
$\Gamma_{13} \phi \eta'$	< 4.3 $\times 10^{-6}$	90%	DESIG=13
$\Gamma_{14} \rho \eta$	< 1.3 $\times 10^{-6}$	90%	DESIG=18
$\Gamma_{15} \rho \eta'$	< 2.5 $\times 10^{-6}$	90%	DESIG=19
$\Gamma_{16} \gamma(1S)$ anything	< 4 $\times 10^{-3}$	90%	DESIG=20
$\Gamma_{17} \gamma(1S) \pi^+ \pi^-$	(8.1 ± 0.6) $\times 10^{-5}$		DESIG=5
$\Gamma_{18} \gamma(1S) \eta$	(1.96 ± 0.11) $\times 10^{-4}$		DESIG=7
$\Gamma_{19} \gamma(2S) \pi^+ \pi^-$	(8.6 ± 1.3) $\times 10^{-5}$		DESIG=17
$\Gamma_{20} h_b(1P) \pi^+ \pi^-$	not seen		DESIG=9
$\Gamma_{21} \bar{d}$ anything	< 1.3 $\times 10^{-5}$	90%	DESIG=21

NODE=M047215;NODE=M047

$\Upsilon(4S)$ PARTIAL WIDTHS

$\Gamma(e^+ e^-)$	Γ_7
VALUE (keV)	DOCUMENT ID TECN COMMENT
0.272±0.029 OUR AVERAGE	
Error includes scale factor of 1.5. See the ideogram below.	
0.321±0.017±0.029	AUBERT 05Q BABR $e^+ e^- \rightarrow$ hadrons
0.28 ± 0.05 ± 0.01	³ ALBRECHT 95E ARG $e^+ e^- \rightarrow$ hadrons
0.192±0.007±0.038	BESSON 85 CLEO $e^+ e^- \rightarrow$ hadrons
0.283±0.037	LOVELOCK 85 CUSB $e^+ e^- \rightarrow$ hadrons

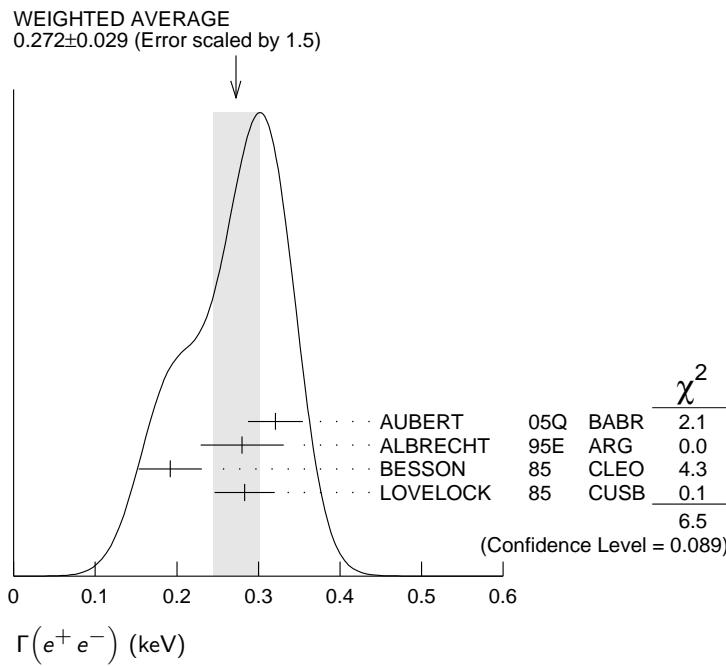
NODE=M047220

NODE=M047W1

NODE=M047W1

³ Using LEYAOUANC 77 parametrization of $\Gamma(s)$.

NODE=M047W1;LINKAGE=A



T(4S) BRANCHING RATIOS

B-B-bar DECAYS

The ratio of branching fraction to charged and neutral B mesons is often derived assuming isospin invariance in the decays, and relies on the knowledge of the B^+/B^0 lifetime ratio. "OUR EVALUATION" is obtained based on averages of rescaled data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at <http://www.slac.stanford.edu/xorg/hfag/>. The averaging/rescaling procedure takes into account the common dependence of the measurement on the value of the lifetime ratio.

$\Gamma(B^+ B^-)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.513±0.006 OUR EVALUATION	Assuming $B(\Upsilon(4S) \rightarrow B\bar{B}) = 1$		

Γ_2/Γ

NODE=M047R11
NODE=M047R11
→ UNCHECKED ←

$\Gamma(D_s^+ \text{ anything} + \text{c.c.})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.178±0.021±0.016	⁴ ARTUSO	05B	$e^+ e^- \rightarrow D_x X$

Γ_3/Γ

NODE=M047R13
NODE=M047R13

⁴ ARTUSO 05B reports $[\Gamma(\Upsilon(4S) \rightarrow D_s^+ \text{ anything} + \text{c.c.})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)] = (8.0 \pm 0.2 \pm 0.9) \times 10^{-3}$ which we divide by our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=M047R13;LINKAGE=AR

$\Gamma(B^0 \bar{B}^0)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
0.487±0.006 OUR EVALUATION	Assuming $B(\Upsilon(4S) \rightarrow B\bar{B}) = 1$		

Γ_4/Γ

NODE=M047R12
NODE=M047R12
→ UNCHECKED ←

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.487 \pm 0.010 \pm 0.008$ ⁵ AUBERT,B 05H BABR $\Upsilon(4S) \rightarrow \bar{B}B \rightarrow D^*\ell\nu_\ell$

5 Direct measurement. This value is averaged with the value extracted from the $\Gamma(B^+ B^-)$ / $\Gamma(B^0 \bar{B}^0)$ measurements.

NODE=M047R12;LINKAGE=AU

$\Gamma(B^+ B^-)/\Gamma(B^0 \bar{B}^0)$

VALUE	DOCUMENT ID	TECN	COMMENT
1.055±0.025 OUR EVALUATION			

Γ_2/Γ_4

NODE=M047R10
NODE=M047R10
→ UNCHECKED ←

$1.006 \pm 0.036 \pm 0.031$

⁶ AUBERT 04F BABR $\Upsilon(4S) \rightarrow B\bar{B} \rightarrow J/\psi K$

$1.01 \pm 0.03 \pm 0.09$

⁶ HASTINGS 03 BELL $\Upsilon(4S) \rightarrow B\bar{B} \rightarrow \text{dileptons}$

$1.058 \pm 0.084 \pm 0.136$

⁷ ATHAR 02 CLEO $\Upsilon(4S) \rightarrow B\bar{B} \rightarrow D^*\ell\nu$

$1.10 \pm 0.06 \pm 0.05$

⁸ AUBERT 02 BABR $\Upsilon(4S) \rightarrow B\bar{B} \rightarrow (c\bar{c})K^*$

$1.04 \pm 0.07 \pm 0.04$

⁹ ALEXANDER 01 CLEO $\Upsilon(4S) \rightarrow B\bar{B} \rightarrow J/\psi K^*$

⁶ HASTINGS 03 and AUBERT 04F assume $\tau(B^+)/\tau(B^0) = 1.083 \pm 0.017$.

⁷ ATTHAR 02 assumes $\tau(B^+)/\tau(B^0) = 1.074 \pm 0.028$. Supersedes BARISH 95.

⁸ AUBERT 02 assumes $\tau(B^+)/\tau(B^0) = 1.062 \pm 0.029$.

⁹ ALEXANDER 01 assumes $\tau(B^+)/\tau(B^0) = 1.066 \pm 0.024$.

$\Gamma(J/\psi K_S^0 (J/\psi, \eta_c) K_S^0)/\Gamma_{\text{total}}$

Forbidden by CP invariance.

VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
<4	90	10 TAJIMA	07A BELL	$\gamma(4S) \rightarrow B^0 \bar{B}^0$

¹⁰ $\gamma(4S)$ with $CP = +1$ decays to the final state with $CP = -1$.

Γ_5/Γ

NODE=M047R10;LINKAGE=F

NODE=M047R10;LINKAGE=D

NODE=M047R10;LINKAGE=E

NODE=M047R10;LINKAGE=C

NODE=M047R16

NODE=M047R16

NODE=M047R16

NODE=M047R16;LINKAGE=TA

NODE=M047NBB

NODE=M047R6

NODE=M047R6

$\Gamma(\text{non-}B\bar{B})/\Gamma_{\text{total}}$

Γ_6/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.04	95	BARISH	96B CLEO	$e^+ e^-$

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$

Γ_7/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
1.57 ± 0.08 OUR AVERAGE			
1.55 $\pm 0.04 \pm 0.07$	AUBERT	05Q BABR	$e^+ e^- \rightarrow \text{hadrons}$

¹¹ Using LEYAOUANC 77 parametrization of $\Gamma(s)$.

$\Gamma(\rho^+ \rho^-)/\Gamma_{\text{total}}$

Γ_8/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 5.7×10^{-6}	90	AUBERT	08BO BABR	$e^+ e^- \rightarrow \pi^+ \pi^- 2\pi^0$

$\Gamma(J/\psi(1S) \text{ anything})/\Gamma_{\text{total}}$

Γ_9/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<1.9	95	12 ABE	02D BELL	$e^+ e^- \rightarrow J/\psi X \rightarrow \ell^+ \ell^- X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.7 90 12 AUBERT 01C BABR $e^+ e^- \rightarrow J/\psi X \rightarrow \ell^+ \ell^- X$

¹² Uses $B(J/\psi \rightarrow e^+ e^-) = 0.0593 \pm 0.0010$ and $B(J/\psi \rightarrow \mu^+ \mu^-) = 0.0588 \pm 0.0010$.

$\Gamma(D^{*+} \text{ anything} + \text{c.c.})/\Gamma_{\text{total}}$

Γ_{10}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.074	90	13 ALEXANDER	90C CLEO	$e^+ e^-$

¹³ For $x > 0.473$.

$\Gamma(\phi \text{ anything})/\Gamma_{\text{total}}$

Γ_{11}/Γ

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
7.1 $\pm 0.1 \pm 0.6$		HUANG 07	CLEO	$\gamma(4S) \rightarrow \phi X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.23 90 14 ALEXANDER 90C CLEO $e^+ e^-$

¹⁴ For $x > 0.52$.

$\Gamma(\phi\eta)/\Gamma_{\text{total}}$

Γ_{12}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.8	90	15 BELOUS 09	BELL	$e^+ e^- \rightarrow \phi\eta$

• • • We do not use the following data for averages, fits, limits, etc. • • •

<2.5 90 AUBERT,BE 06F BABR $e^+ e^- \rightarrow \phi\eta$

¹⁵ Using all intermediate branching fraction values from PDG 08.

$\Gamma(\phi\eta')/\Gamma_{\text{total}}$

Γ_{13}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<4.3	90	16 BELOUS 09	BELL	$e^+ e^- \rightarrow \phi\eta'$

¹⁶ Using all intermediate branching fraction values from PDG 08.

$\Gamma(\rho\eta)/\Gamma_{\text{total}}$

Γ_{14}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
<1.3	90	17 BELOUS 09	BELL	$e^+ e^- \rightarrow \rho\eta$

¹⁷ Using all intermediate branching fraction values from PDG 08.

NODE=M047R10;LINKAGE=F

NODE=M047R10;LINKAGE=D

NODE=M047R10;LINKAGE=E

NODE=M047R10;LINKAGE=C

NODE=M047R16

NODE=M047R16

NODE=M047R16

NODE=M047R16;LINKAGE=TA

NODE=M047NBB

NODE=M047R6

NODE=M047R6

NODE=M047R5

NODE=M047R5

NODE=M047R5;LINKAGE=A

NODE=M047R17

NODE=M047R17

NODE=M047R1

NODE=M047R1

NODE=M047R;LINKAGE=AC

NODE=M047R2

NODE=M047R2

NODE=M047R2;LINKAGE=A

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NODE=M047R21

NODE=M047R21

NODE=M047R21;LINKAGE=BE

NODE=M047R22

NODE=M047R22

NODE=M047R22;LINKAGE=BE

$\Gamma(\rho\eta')/\Gamma_{\text{total}}$					Γ_{15}/Γ
<u>VALUE (units 10^{-6})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<2.5	90	18 BELOUS	09	BELL $e^+ e^- \rightarrow \rho\eta'$	

18 Using all intermediate branching fraction values from PDG 08.

$\Gamma(\Upsilon(1S) \text{ anything})/\Gamma_{\text{total}}$					Γ_{16}/Γ
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.004	90	ALEXANDER	90C	CLEO $e^+ e^-$	

$\Gamma(\Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{17}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
8.1 ± 0.6 OUR AVERAGE					

8.5 ± 1.3 ± 0.2	113 ± 16	19 SOKOLOV09	BELL	$e^+ e^- \rightarrow \pi^+ \pi^- \mu^+ \mu^-$	
8.00 ± 0.64 ± 0.27	430	20 AUBERT	08BP BABR	$\Upsilon(4S) \rightarrow \pi^+ \pi^- \ell^+ \ell^-$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
17.8 ± 4.0 ± 0.3		21,22 SOKOLOV07	BELL	$e^+ e^- \rightarrow \pi^+ \pi^- \mu^+ \mu^-$	
9.0 ± 1.5 ± 0.2	167 ± 19	23 AUBERT	06R BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \mu^+ \mu^-$	
<12	90	GLENN	99 CLE2	$e^+ e^-$	

19 SOKOLOV 09 reports $[\Gamma(\Upsilon(4S) \rightarrow \Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(1S) \rightarrow \mu^+ \mu^-)] = (0.211 \pm 0.030 \pm 0.014) \times 10^{-5}$ which we divide by our best value $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

20 Using $B(\Upsilon(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$ and $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$.

21 SOKOLOV 07 reports $[\Gamma(\Upsilon(4S) \rightarrow \Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(1S) \rightarrow \mu^+ \mu^-)] = (4.42 \pm 0.81 \pm 0.56) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

22 According to the authors, systematic errors were underestimated.

23 Superseded by AUBERT 08BP. AUBERT 06R reports $[\Gamma(\Upsilon(4S) \rightarrow \Upsilon(1S)\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(1S) \rightarrow \mu^+ \mu^-)] = (2.23 \pm 0.25 \pm 0.27) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Upsilon(1S)\eta)/\Gamma_{\text{total}}$					Γ_{18}/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1.96±0.06±0.09	56	24 AUBERT	08BP BABR	$\Upsilon(4S) \rightarrow \pi^+ \pi^- \pi^0 \ell^+ \ell^-$	

24 Using $B(\Upsilon(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$ and $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$.

$\Gamma(\Upsilon(1S)\eta)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$					Γ_{18}/Γ_{17}
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

2.41 ± 0.40 ± 0.12	56	25 AUBERT	08BP BABR	$\Upsilon(4S) \rightarrow \pi^+ \pi^- (\pi^0) \ell^+ \ell^-$	
--------------------	----	-----------	-----------	--	--

25 Not independent of other values reported by AUBERT 08BP.

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$					Γ_{19}/Γ
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.86±0.11±0.07		220	26 AUBERT	08BP BABR	$\Upsilon(4S) \rightarrow \pi^+ \pi^- \ell^+ \ell^-$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.88 ± 0.17 ± 0.08	97 ± 15	27 AUBERT	06R BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \mu^+ \mu^-$	
<3.9	90	GLENN	99 CLE2	$e^+ e^-$	

26 Using $B(\Upsilon(2S) \rightarrow e^+ e^-) = (1.91 \pm 0.16)\%$ and $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.93 \pm 0.17)\%$.

27 Superseded by AUBERT 08BP. AUBERT 06R reports $[\Gamma(\Upsilon(4S) \rightarrow \Upsilon(2S)\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\Upsilon(2S) \rightarrow \mu^+ \mu^-)] = (1.69 \pm 0.26 \pm 0.20) \times 10^{-6}$ which we divide by our best value $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.93 \pm 0.17) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Upsilon(2S)\pi^+\pi^-)/\Gamma(\Upsilon(1S)\pi^+\pi^-)$					Γ_{19}/Γ_{17}
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.16 ± 0.16 ± 0.14	220	28 AUBERT	08BP BABR	$\Upsilon(4S) \rightarrow \pi^+ \pi^- \ell^+ \ell^-$	
--------------------	-----	-----------	-----------	--	--

28 Using $B(\Upsilon(1S) \rightarrow e^+ e^-) = (2.38 \pm 0.11)\%$, $B(\Upsilon(1S) \rightarrow \mu^+ \mu^-) = (2.48 \pm 0.05)\%$, $B(\Upsilon(2S) \rightarrow e^+ e^-) = (1.91 \pm 0.16)\%$, and $B(\Upsilon(2S) \rightarrow \mu^+ \mu^-) = (1.93 \pm 0.17)\%$. Not independent of other values reported by AUBERT 08BP.

NODE=M047R23
NODE=M047R23

NODE=M047R23;LINKAGE=BE

NODE=M047R4
NODE=M047R4

NODE=M047R7
NODE=M047R7

NODE=M047R7;LINKAGE=SK

NODE=M047R7;LINKAGE=UB

NODE=M047R7;LINKAGE=SO

NODE=M047R18
NODE=M047R18

NODE=M047R18;LINKAGE=UB

NODE=M047R19
NODE=M047R19

NODE=M047R9;LINKAGE=UB

NODE=M047R9;LINKAGE=AU

NODE=M047R20
NODE=M047R20

NODE=M047R20;LINKAGE=UB

$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma_{\text{total}}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_{20}/Γ
not seen	$35 \pm 21k$	29 ADACHI	12 BELL	$10.58 e^+ e^- \rightarrow h_b(1P)\pi^+\pi^-$	

29 From the upper limit on the ratio of $\sigma(e^+ e^- \rightarrow h_b(1P)\pi^+\pi^-)$ at the $\Upsilon(4S)$ to that at the $\Upsilon(5S)$ of 0.27.

 $\Gamma(\bar{d} \text{ anything})/\Gamma_{\text{total}}$

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT	Γ_{21}/Γ
<1.3	90	ASNER	07 CLEO	$e^+ e^- \rightarrow \bar{d}X$	

 $\Upsilon(4S)$ REFERENCES

ADACHI 12	PRL 108 032001	I. Adachi <i>et al.</i>	(BELLE Collab.)
BELOUS 09	PL B681 400	K. Belous <i>et al.</i>	(BELLE Collab.)
SOKOLOV 09	PR D79 051103	A. Sokolov <i>et al.</i>	(BELLE Collab.)
AUBERT 08BO	PR D78 071103	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 08BP	PR D78 112002	B. Aubert <i>et al.</i>	(BABAR Collab.)
PDG 08	PL B667 1	C. Amsler <i>et al.</i>	(PDG Collab.)
ASNER 07	PR D75 012009	D.M. Asner <i>et al.</i>	(CLEO Collab.)
HUANG 07	PR D75 012002	G.S. Huang <i>et al.</i>	(CLEO Collab.)
SOKOLOV 07	PR D75 071103	A. Sokolov <i>et al.</i>	(BELLE Collab.)
TAJIMA 07A	PRL 99 211601	O. Tajima <i>et al.</i>	(BELLE Collab.)
AUBERT 06R	PRL 96 232001	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,BE 06F	PR D74 111103	B. Aubert <i>et al.</i>	(BABAR Collab.)
ARTUSO 05B	PRL 95 261801	M. Artuso <i>et al.</i>	(CLEO Collab.)
AUBERT 05Q	PR D72 032005	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,B 05H	PRL 95 042001	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT 04F	PR D69 071101	B. Aubert <i>et al.</i>	(BABAR Collab.)
HASTINGS 03	PR D67 052004	N.C. Hastings <i>et al.</i>	(BELLE Collab.)
ABE 02D	PR E89 052001	K. Abe <i>et al.</i>	(BELLE Collab.)
ATHAR 02	PR D66 052003	S.B. Athar <i>et al.</i>	(CLEO Collab.)
AUBERT 02	PR D65 032001	B. Aubert <i>et al.</i>	(BaBar Collab.)
ALEXANDER 01	PRL 86 2737	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
AUBERT 01C	PRL 87 162002	B. Aubert <i>et al.</i>	(BaBar Collab.)
GLENN 99	PR D59 052003	S. Glenn <i>et al.</i>	(CLEO Collab.)
BARISH 96B	PRL 76 1570	B.C. Barish <i>et al.</i>	(CLEO Collab.)
ALBRECHT 95E	ZPHY C65 619	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BARISH 95	PR D51 1014	B.C. Barish <i>et al.</i>	(CLEO Collab.)
ALEXANDER 90C	PRL 64 2226	J. Alexander <i>et al.</i>	(CLEO Collab.)
BEBEK 87	PR D36 1289	C. Bebek <i>et al.</i>	(CLEO Collab.)
BESSON 85	PRL 54 381	D. Besson <i>et al.</i>	(CLEO Collab.)
LOVELOCK 85	PRL 54 377	D.M.J. Lovelock <i>et al.</i>	(CUSB Collab.)
LEYAUANC 77	PL B71 397	A. Le Yaouanc <i>et al.</i>	(ORsay)

 $X(10610)^\pm$ $I^G(J^P) = ?^+(1^+)$

OMITTED FROM SUMMARY TABLE

Observed by BONDAR 12 in $\Upsilon(5S)$ decays to $\Upsilon(nS)\pi^+\pi^-$ ($n = 1, 2, 3$) and $h_b(mP)\pi^+\pi^-$ ($m = 1, 2$). $J^P = 1^+$ is favored from angular analyses.

 $X(10610)^\pm$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	Γ_{207M}/Γ
10607.2 ± 2.0	¹ BONDAR	12 BELL	$e^+ e^- \rightarrow \text{hadrons}$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10611 ± 4 ± 3	² BONDAR	12 BELL	$e^+ e^- \rightarrow \Upsilon(1S)\pi^+\pi^-$	OCCUR=2
10609 ± 2 ± 3	² BONDAR	12 BELL	$e^+ e^- \rightarrow \Upsilon(2S)\pi^+\pi^-$	OCCUR=3
10608 ± 2 ± 3	² BONDAR	12 BELL	$e^+ e^- \rightarrow \Upsilon(3S)\pi^+\pi^-$	OCCUR=4
10605 ± 2 ± 3	² BONDAR	12 BELL	$e^+ e^- \rightarrow h_b(1P)\pi^+\pi^-$	OCCUR=5
10599 +6 -3 +5 -4	² BONDAR	12 BELL	$e^+ e^- \rightarrow h_b(2P)\pi^+\pi^-$	OCCUR=6

1 Average of the BONDAR 12 measurements in separate channels.

2 Superseded by the average measurement of BONDAR 12.

 $X(10610)^\pm$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	Γ_{207W}/Γ
18.4 ± 2.4	³ BONDAR	12 BELL	$e^+ e^- \rightarrow \text{hadrons}$	

NODE=M047R01
NODE=M047R01

NODE=M047R01;LINKAGE=AD

NODE=M047R15
NODE=M047R15

NODE=M047

REFID=53962
REFID=53107
REFID=52760
REFID=52659
REFID=52660
REFID=52166
REFID=51617
REFID=51624
REFID=51715
REFID=52066
REFID=51143
REFID=51563
REFID=50992
REFID=50774
REFID=50777
REFID=49748
REFID=49209
REFID=48557
REFID=48832
REFID=48514
REFID=48316
REFID=48346
REFID=46890
REFID=44693
REFID=44372
REFID=44139
REFID=41346
REFID=40270
REFID=22368
REFID=22369
REFID=44695

NODE=M207

NODE=M207

NODE=M207M

NODE=M207M

OCCUR=2

OCCUR=3

OCCUR=4

OCCUR=5

OCCUR=6

NODE=M207M;LINKAGE=BO

NODE=M207M;LINKAGE=BN

NODE=M207W

NODE=M207W

• • • We do not use the following data for averages, fits, limits, etc. • • •

$22.3 \pm 7.7^{+3.0}_{-4.0}$	⁴ BONDAR	12	BELL	$e^+ e^- \rightarrow \gamma(1S)\pi^+\pi^-$	OCCUR=2
$24.2 \pm 3.1^{+2.0}_{-3.0}$	⁴ BONDAR	12	BELL	$e^+ e^- \rightarrow \gamma(2S)\pi^+\pi^-$	OCCUR=3
$17.6 \pm 3.0 \pm 3.0$	⁴ BONDAR	12	BELL	$e^+ e^- \rightarrow \gamma(3S)\pi^+\pi^-$	OCCUR=4
$11.4^{+4.5+2.1}_{-3.9-1.2}$	⁴ BONDAR	12	BELL	$e^+ e^- \rightarrow h_b(1P)\pi^+\pi^-$	OCCUR=5
$13^{+10}_{-8} {}^{+9}_{-7}$	⁴ BONDAR	12	BELL	$e^+ e^- \rightarrow h_b(2P)\pi^+\pi^-$	OCCUR=6

³ Average of the BONDAR 12 measurements in separate channels.
⁴ Superseded by the average measurement of BONDAR 12.

X(10610)⁺ DECAY MODES

X(10610)⁻ decay modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)	
$\Gamma_1 \quad \gamma(1S)\pi^+$	seen	
$\Gamma_2 \quad \gamma(2S)\pi^+$	seen	
$\Gamma_3 \quad \gamma(3S)\pi^+$	seen	
$\Gamma_4 \quad h_b(1P)\pi^+$	seen	
$\Gamma_5 \quad h_b(2P)\pi^+$	seen	

X(10610)[±] BRANCHING RATIOS

$\Gamma(\gamma(1S)\pi^+)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12	BELL	$e^+ e^- \rightarrow \gamma(1S)\pi^+\pi^-$

DESIG=1
DESIG=2
DESIG=3
DESIG=4
DESIG=5

NODE=M207225

$\Gamma(\gamma(2S)\pi^+)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12	BELL	$e^+ e^- \rightarrow \gamma(2S)\pi^+\pi^-$

NODE=M207R01
NODE=M207R01

NODE=M207R02
NODE=M207R02

$\Gamma(\gamma(3S)\pi^+)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12	BELL	$e^+ e^- \rightarrow \gamma(3S)\pi^+\pi^-$

NODE=M207R03
NODE=M207R03

$\Gamma(h_b(1P)\pi^+)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12	BELL	$e^+ e^- \rightarrow h_b(1P)\pi^+\pi^-$

NODE=M207R04
NODE=M207R04

$\Gamma(h_b(2P)\pi^+)/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12	BELL	$e^+ e^- \rightarrow h_b(2P)\pi^+\pi^-$

NODE=M207R05
NODE=M207R05

X(10610)[±] REFERENCES

BONDAR 12

PRL 108 122001

A. Bondar *et al.*

(BELLE Collab.)

NODE=M207

REFID=53963

NODE=M208

X(10650) $^\pm$

$I^G(J^P) = ?^+(1^+)$

OMITTED FROM SUMMARY TABLE

Observed by BONDAR 12 in $\Upsilon(5S)$ decays to $\Upsilon(nS)\pi^+\pi^-$ ($n = 1, 2, 3$) and $h_b(mP)\pi^+\pi^-$ ($m = 1, 2$). $J^P = 1^+$ is favored from angular analyses.

NODE=M208

X(10650) $^\pm$ MASS

NODE=M208M

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
10652.2\pm1.5	1 BONDAR	12 BELL	$e^+e^- \rightarrow$ hadrons	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10657 ± 6 ± 3	2 BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(1S)\pi^+\pi^-$	OCCUR=2
10651 ± 2 ± 3	2 BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(2S)\pi^+\pi^-$	OCCUR=3
10652 ± 1 ± 2	2 BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(3S)\pi^+\pi^-$	OCCUR=4
10654 ± 3 ± 1	2 BONDAR	12 BELL	$e^+e^- \rightarrow h_b(1P)\pi^+\pi^-$	OCCUR=5
10651 ± 2 ± 3	2 BONDAR	12 BELL	$e^+e^- \rightarrow h_b(2P)\pi^+\pi^-$	OCCUR=6

¹ Average of the BONDAR 12 measurements in separate channels.² Superseded by the average measurement of BONDAR 12.NODE=M208M;LINKAGE=BO
NODE=M208M;LINKAGE=BN**X(10650) $^\pm$ WIDTH**

NODE=M208W

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT	
11.5\pm2.2	3 BONDAR	12 BELL	$e^+e^- \rightarrow$ hadrons	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
16.3 \pm 9.8 \pm 6.0	4 BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(1S)\pi^+\pi^-$	OCCUR=2
13.3 \pm 3.3 \pm 4.0	4 BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(2S)\pi^+\pi^-$	OCCUR=3
8.4 \pm 2.0 \pm 2.0	4 BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(3S)\pi^+\pi^-$	OCCUR=4
20.9 \pm 5.4 \pm 2.1	4 BONDAR	12 BELL	$e^+e^- \rightarrow h_b(1P)\pi^+\pi^-$	OCCUR=5
19 \pm 7 \pm 11	4 BONDAR	12 BELL	$e^+e^- \rightarrow h_b(2P)\pi^+\pi^-$	OCCUR=6

³ Average of the BONDAR 12 measurements in separate channels.⁴ Superseded by the average measurement of BONDAR 12.NODE=M208W;LINKAGE=BO
NODE=M208W;LINKAGE=BN**X(10650) $^+$ DECAY MODES**

NODE=M208215;NODE=M208

 $X(10650)^-$ decay modes are charge conjugates of the modes below.

Mode	Fraction (Γ_i/Γ)	
$\Gamma_1 \ Upsilon(1S)\pi^+$	seen	
$\Gamma_2 \ Upsilon(2S)\pi^+$	seen	
$\Gamma_3 \ Upsilon(3S)\pi^+$	seen	
$\Gamma_4 \ h_b(1P)\pi^+$	seen	
$\Gamma_5 \ h_b(2P)\pi^+$	seen	

DESIG=1

DESIG=2

DESIG=3

DESIG=4

DESIG=5

NODE=M208225

$\Gamma(\Upsilon(1S)\pi^+)/\Gamma_{\text{total}}$	Γ_1/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(1S)\pi^+\pi^-$	

NODE=M208R01
NODE=M208R01

$\Gamma(\Upsilon(2S)\pi^+)/\Gamma_{\text{total}}$	Γ_2/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(2S)\pi^+\pi^-$	

NODE=M208R02
NODE=M208R02

$\Gamma(\Upsilon(3S)\pi^+)/\Gamma_{\text{total}}$	Γ_3/Γ			
VALUE	DOCUMENT ID	TECN	COMMENT	
seen	BONDAR	12 BELL	$e^+e^- \rightarrow \Upsilon(3S)\pi^+\pi^-$	

NODE=M208R03
NODE=M208R03

$\Gamma(h_b(1P)\pi^+)/\Gamma_{\text{total}}$

VALUE

seen

DOCUMENT ID

BONDAR 12 BELL

COMMENT

 Γ_4/Γ

NODE=M208R04

NODE=M208R04

 $\Gamma(h_b(2P)\pi^+)/\Gamma_{\text{total}}$

VALUE

seen

DOCUMENT ID

BONDAR 12 BELL

COMMENT

 Γ_5/Γ

NODE=M208R05

NODE=M208R05

 $X(10650)^{\pm}$ REFERENCES

BONDAR 12 PRL 108 122001

A. Bondar *et al.*

(BELLE Collab.)

 $\gamma(10860)$ $I^G(J^{PC}) = 0^-(1^{--})$ $\gamma(10860)$ MASS

VALUE (MeV)

DOCUMENT ID

TECN

COMMENT

10876 ±11 OUR EVALUATION Weighted-average of Belle and BaBar results, but tripling the scaling S -factors applied to the uncertainties to account for model-dependence, handling of radiative corrections, and interference effects.

• • • We do not use the following data for averages, fits, limits, etc. • • •

10879 ± 3	1,2 CHEN	10 BELL	$e^+ e^- \rightarrow$ hadrons
10888.4 ± 2.7	3 CHEN	10 BELL	$e^+ e^- \rightarrow \gamma(1S, 2S, 3S)\pi^+\pi^-$
10876 ± 2	1 AUBERT	09E BABR	$e^+ e^- \rightarrow$ hadrons
10869 ± 2	4 AUBERT	09E BABR	$e^+ e^- \rightarrow$ hadrons
10868 ± 6 ± 5	5 BESSON	85 CLEO	$e^+ e^- \rightarrow$ hadrons
10845 ± 20	6 LOVELOCK	85 CUSB	$e^+ e^- \rightarrow$ hadrons

1 In a model where a flat non-resonant $b\bar{b}$ -continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated.

2 The parameters of the $\gamma(11020)$ are fixed to those in AUBERT 09E.

3 In a model where a flat nonresonant $\gamma(1S, 2S, 3S)\pi^+\pi^-$ continuum interferes with a single Breit-Wigner resonance.

4 In a model where a non-resonant $b\bar{b}$ -continuum represented by a threshold function at $\sqrt{s}=2m_B$ is incoherently added to a flat component interfering with two Breit-Wigner resonances. Not independent of other AUBERT 09E results. Systematic uncertainties not estimated.

5 Assuming four Gaussians with radiative tails and a single step in R .

6 In a coupled-channel model with three resonances and a smooth step in R .

 $\gamma(10860)$ WIDTH

VALUE (MeV)

DOCUMENT ID

TECN

COMMENT

55 ±28 OUR EVALUATION Weighted-average of Belle and BaBar results, but tripling the scaling S -factors applied to the uncertainties to account for model-dependence, handling of radiative corrections, and interference effects.

• • • We do not use the following data for averages, fits, limits, etc. • • •

46 ± 9	7,8 CHEN	10 BELL	$e^+ e^- \rightarrow$ hadrons
30.7 ± 8.3	9 CHEN	10 BELL	$e^+ e^- \rightarrow \gamma(1S, 2S, 3S)\pi^+\pi^-$
43 ± 4	7 AUBERT	09E BABR	$e^+ e^- \rightarrow$ hadrons
74 ± 4	10 AUBERT	09E BABR	$e^+ e^- \rightarrow$ hadrons
112 ± 17 ± 23	11 BESSON	85 CLEO	$e^+ e^- \rightarrow$ hadrons
110 ± 15	12 LOVELOCK	85 CUSB	$e^+ e^- \rightarrow$ hadrons

7 In a model where a flat non-resonant $b\bar{b}$ -continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated.

8 The parameters of the $\gamma(11020)$ are fixed to those in AUBERT 09E.

9 In a model where a flat nonresonant $\gamma(1S, 2S, 3S)\pi^+\pi^-$ continuum interferes with a single Breit-Wigner resonance.

10 In a model where a non-resonant $b\bar{b}$ -continuum represented by a threshold function at $\sqrt{s}=2m_B$ is incoherently added to a flat component interfering with two Breit-Wigner resonances. Not independent of other AUBERT 09E results. Systematic uncertainties not estimated.

11 Assuming four Gaussians with radiative tails and a single step in R .

12 In a coupled-channel model with three resonances and a smooth step in R .

NODE=M208R04

NODE=M208R04

NODE=M208R05

NODE=M208R05

NODE=M208

REFID=53963

NODE=M092

NODE=M092M

NODE=M092M

→ UNCHECKED ←

OCCUR=2

OCCUR=2

NODE=M092M;LINKAGE=AU

NODE=M092M;LINKAGE=CH

NODE=M092M;LINKAGE=CE

NODE=M092M;LINKAGE=UB

NODE=M092M;LINKAGE=BE

NODE=M092M;LINKAGE=LO

NODE=M092W

NODE=M092W

→ UNCHECKED ←

OCCUR=2

OCCUR=2

NODE=M092W;LINKAGE=AU

NODE=M092W;LINKAGE=CH

NODE=M092W;LINKAGE=CE

NODE=M092W;LINKAGE=UB

NODE=M092W;LINKAGE=BE

NODE=M092W;LINKAGE=LO

$\Upsilon(10860)$ DECAY MODES

NODE=M092215;NODE=M092

Mode	Fraction (Γ_i/Γ)	Confidence level	
$\Gamma_1 B\bar{B}X$	(75.9 $\pm^{+2.7}_{-4.0}$) %		DESIG=9
$\Gamma_2 B\bar{B}$	(5.5 ± 1.0) %		DESIG=2
$\Gamma_3 B\bar{B}^* + \text{c.c.}$	(13.7 ± 1.6) %		DESIG=3
$\Gamma_4 B^*\bar{B}^*$	(38.1 ± 3.4) %		DESIG=4
$\Gamma_5 B\bar{B}^{(*)}\pi$	< 19.7 %	90%	DESIG=10
$\Gamma_6 B\bar{B}\pi$	(0.0 ± 1.2) %		DESIG=23
$\Gamma_7 B^*\bar{B}\pi + B\bar{B}^*\pi$	(7.3 ± 2.3) %		DESIG=24
$\Gamma_8 B^*\bar{B}^*\pi$	(1.0 ± 1.4) %		DESIG=25
$\Gamma_9 B\bar{B}\pi\pi$	< 8.9 %	90%	DESIG=11
$\Gamma_{10} B_s^{(*)}\bar{B}_s^{(*)}$	(19.9 ± 3.0) %		DESIG=16
$\Gamma_{11} B_s\bar{B}_s$	(5 ± 5) $\times 10^{-3}$		DESIG=5
$\Gamma_{12} B_s\bar{B}_s^* + \text{c.c.}$	(1.34 ± 0.32) %		DESIG=7
$\Gamma_{13} B_s^*\bar{B}_s^*$	(17.5 ± 2.6) %		DESIG=8
Γ_{14} no open-bottom	(4.2 ± 5.0) %		DESIG=28
$\Gamma_{15} e^+e^-$	(5.6 ± 3.1) $\times 10^{-6}$		DESIG=1
$\Gamma_{16} \Upsilon(1S)\pi^+\pi^-$	(5.3 ± 0.6) $\times 10^{-3}$		DESIG=17
$\Gamma_{17} \Upsilon(2S)\pi^+\pi^-$	(7.8 ± 1.3) $\times 10^{-3}$		DESIG=18
$\Gamma_{18} \Upsilon(3S)\pi^+\pi^-$	(4.8 ± 1.9) $\times 10^{-3}$		DESIG=19
$\Gamma_{19} \Upsilon(1S)K^+K^-$	(6.1 ± 1.8) $\times 10^{-4}$		DESIG=20
$\Gamma_{20} h_b(1P)\pi^+\pi^-$	(3.5 ± 1.0) $\times 10^{-3}$		DESIG=26
$\Gamma_{21} h_b(2P)\pi^+\pi^-$	(6.0 ± 2.1) $\times 10^{-3}$		DESIG=27

Inclusive Decays.

These decay modes are submodes of one or more of the decay modes above.

$\Gamma_{22} \phi$ anything	(13.8 ± 2.4) %		DESIG=12
$\Gamma_{23} D^0$ anything + c.c.	(108 ± 8) %		DESIG=13
$\Gamma_{24} D_s$ anything + c.c.	(46 ± 6) %		DESIG=6
$\Gamma_{25} J/\psi$ anything	(2.06 ± 0.21) %		DESIG=14
$\Gamma_{26} B^0$ anything + c.c.	(77 ± 8) %		DESIG=21
$\Gamma_{27} B^+$ anything + c.c.	(72 ± 6) %		DESIG=22

 $\Upsilon(10860)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$			Γ_{15}
VALUE (keV)	DOCUMENT ID	TECN	COMMENT
0.31 ± 0.07 OUR AVERAGE	Error includes scale factor of 1.3.		
0.22 ± 0.05 ± 0.07	BESSON 85	CLEO	$e^+e^- \rightarrow \text{hadrons}$
0.365 ± 0.070	LOVELOCK 85	CUSB	$e^+e^- \rightarrow \text{hadrons}$

 $\Upsilon(10860)$ BRANCHING RATIOS

"OUR EVALUATION" is obtained based on averages of rescaled data listed below. The averages and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at <http://www.slac.stanford.edu/xorg/hfag/>.

$\Gamma(B\bar{B}X)/\Gamma_{\text{total}}$		Γ_1/Γ		
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.759 ± 0.027 OUR EVALUATION				
0.71 ± 0.06 OUR AVERAGE	1063	13 DRUTSKOY	10 BELL	$\Upsilon(5S) \rightarrow B^+ X, B^0 X$
0.737 ± 0.032 ± 0.051				
0.589 ± 0.100 ± 0.092		14 HUANG	07 CLEO	$\Upsilon(5S) \rightarrow \text{hadrons}$

NODE=M092220

NODE=M092W1
NODE=M092W1

NODE=M092230

NODE=M092230

NODE=M092R13
NODE=M092R13

→ UNCHECKED ←

$\Gamma(B\bar{B})/\Gamma_{\text{total}}$	Γ_2/Γ	NODE=M092R16 NODE=M092R16
$\frac{\text{VALUE (units } 10^{-2}\text{)}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
$5.5^{+1.0}_{-0.9} \pm 0.4$		
15 DRUTSKOY 10 BELL $\gamma(5S) \rightarrow B^+ X, B^0 X$		
• • • We do not use the following data for averages, fits, limits, etc. • • •		
<13.8 90 14 HUANG 07 CLEO $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B\bar{B})/\Gamma(B\bar{B}X)$	Γ_2/Γ_1	NODE=M092R05 NODE=M092R05
$\frac{\text{VALUE}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
<0.22 90 AQUINES 06 CLE3 $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B\bar{B}^* + \text{c.c.})/\Gamma_{\text{total}}$	Γ_3/Γ	NODE=M092R15 NODE=M092R15
$\frac{\text{VALUE}}{\text{}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
0.137±0.016 OUR AVERAGE		
0.137±0.013±0.011	15 DRUTSKOY 10 BELL $\gamma(5S) \rightarrow B^+ X, B^0 X$	
0.143±0.053±0.027	14 HUANG 07 CLEO $\gamma(5S) \rightarrow \text{hadrons}$	
$\Gamma(B\bar{B}^* + \text{c.c.})/\Gamma(B\bar{B}X)$	Γ_3/Γ_1	NODE=M092R06 NODE=M092R06
$\frac{\text{VALUE}}{\text{EVTS}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
0.24±0.09±0.03 10 AQUINES 06 CLE3 $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B^*\bar{B}^*)/\Gamma_{\text{total}}$	Γ_4/Γ	NODE=M092R14 NODE=M092R14
$\frac{\text{VALUE}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
0.381±0.034 OUR AVERAGE		
0.375 $^{+0.021}_{-0.019} \pm 0.030$	15 DRUTSKOY 10 BELL $\gamma(5S) \rightarrow B^+ X, B^0 X$	
0.436±0.083±0.072	14 HUANG 07 CLEO $\gamma(5S) \rightarrow \text{hadrons}$	
$\Gamma(B^*\bar{B}^*)/\Gamma(B\bar{B}X)$	Γ_4/Γ_1	NODE=M092R07 NODE=M092R07
$\frac{\text{VALUE}}{\text{EVTS}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
0.74±0.15±0.08 31 AQUINES 06 CLE3 $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B\bar{B}^*(\pi)/\Gamma_{\text{total}}$	Γ_5/Γ	NODE=M092R17 NODE=M092R17
$\frac{\text{VALUE}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
<0.197 90 14 HUANG 07 CLE3 $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B\bar{B}^*(\pi)/\Gamma(B\bar{B}X)$	Γ_5/Γ_1	NODE=M092R08 NODE=M092R08
$\frac{\text{VALUE}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
<0.32 90 AQUINES 06 CLE3 $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B\bar{B}\pi)/\Gamma_{\text{total}}$	Γ_6/Γ	NODE=M092R28 NODE=M092R28
$\frac{\text{VALUE (units } 10^{-2}\text{)}}{\text{EVTS}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
0.0±1.2±0.3 0 15 DRUTSKOY 10 BELL $\gamma(5S) \rightarrow B^{+,0} \pi^- X$		
$[\Gamma(B^*\bar{B}\pi) + \Gamma(B\bar{B}^*\pi)]/\Gamma_{\text{total}}$	Γ_7/Γ	NODE=M092R29 NODE=M092R29
$\frac{\text{VALUE (units } 10^{-2}\text{)}}{\text{EVTS}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
7.3$^{+2.3}_{-2.1} \pm 0.8$ 38 15 DRUTSKOY 10 BELL $\gamma(5S) \rightarrow B^{+,0} \pi^- X$		
$\Gamma(B^*\bar{B}^*\pi)/\Gamma_{\text{total}}$	Γ_8/Γ	NODE=M092R30 NODE=M092R30
$\frac{\text{VALUE (units } 10^{-2}\text{)}}{\text{EVTS}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
1.0$^{+1.4}_{-1.3} \pm 0.4$ 5 15 DRUTSKOY 10 BELL $\gamma(5S) \rightarrow B^{+,0} \pi^- X$		
$\Gamma(B\bar{B}\pi\pi)/\Gamma_{\text{total}}$	Γ_9/Γ	NODE=M092R18 NODE=M092R18
$\frac{\text{VALUE}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
<0.089 90 14 HUANG 07 CLEO $\gamma(5S) \rightarrow \text{hadrons}$		
$\Gamma(B\bar{B}\pi\pi)/\Gamma(B\bar{B}X)$	Γ_9/Γ_1	NODE=M092R09 NODE=M092R09
$\frac{\text{VALUE}}{\text{CL\%}}$	$\frac{\text{DOCUMENT ID}}{\text{TECN}} \quad \frac{\text{COMMENT}}{\text{}}$	
<0.14 90 AQUINES 06 CLE3 $\gamma(5S) \rightarrow \text{hadrons}$		

$\Gamma(B_s^{(*)}\bar{B}_s^{(*)})/\Gamma_{\text{total}}$	$\Gamma_{10}/\Gamma = (\Gamma_{11} + \Gamma_{12} + \Gamma_{13})/\Gamma$
<u>VALUE</u> 0.199±0.030 OUR EVALUATION	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

0.189+0.027 -0.021 OUR AVERAGE

[0.195+0.030 -0.023 OUR 2012 AVERAGE]

0.172±0.030	16 ESEN	13 BELL	$\gamma(5S) \rightarrow D^0 X, D_s X$
0.21 +0.06 -0.03	17 HUANG	07 CLEO	$\gamma(5S) \rightarrow D_s X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.180±0.013±0.032	18 DRUTSKOY	07 BELL	$\gamma(5S) \rightarrow D^0 X, D_s X$
0.160±0.026±0.058	19 ARTUSO	05B CLEO	$e^+ e^- \rightarrow D_X X$

$\Gamma(B_s^{(*)}\bar{B}_s^{(*)})/\Gamma(B\bar{B}X)$	Γ_{10}/Γ_1
<u>VALUE</u>	<u>DOCUMENT ID</u>

0.262+0.051 -0.043 OUR EVALUATION

$\Gamma(B_s^*\bar{B}_s^*)/\Gamma(B_s^{(*)}\bar{B}_s^{(*)})$	$\Gamma_{13}/\Gamma_{10} = \Gamma_{13}/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13})$
<u>VALUE (units 10^{-2})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

87.8±1.5 OUR AVERAGE[(90 ± 4) × 10⁻² OUR 2012 AVERAGE]

87.0±1.7	20,21 ESEN	13 BELL	$B_s^0 \rightarrow D_s^- \pi^+$
90.5±3.2±0.1	227 21,22 LI	12 BELL	$B_s^0 \rightarrow J/\psi \eta(')$

• • • We do not use the following data for averages, fits, limits, etc. • • •

90.1+3.8±0.2	23 LOUVOT	09 BELL	$10.86 e^+ e^- \rightarrow B_s^{(*)}\bar{B}_s^{(*)}$
93 +7 -9 ± 1	23 DRUTSKOY	07A BELL	Superseded by LOUVOT 09

$\Gamma(B_s\bar{B}_s)/\Gamma(B_s^{(*)}\bar{B}_s^{(*)})$	$\Gamma_{11}/\Gamma_{10} = \Gamma_{11}/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13})$
<u>VALUE (units 10^{-2})</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

2.6+2.6 -2.5

$\Gamma(B_s\bar{B}_s)/\Gamma(B_s^*\bar{B}_s^*)$	Γ_{11}/Γ_{13}
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

<0.16

90 BONVICINI 06 CLE3 $e^+ e^-$

$\Gamma(B_s\bar{B}_s^* + \text{c.c.})/\Gamma(B_s^{(*)}\bar{B}_s^{(*)})$	$\Gamma_{12}/\Gamma_{10} = \Gamma_{12}/(\Gamma_{11} + \Gamma_{12} + \Gamma_{13})$
<u>VALUE (units 10^{-2})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

6.7±1.2 OUR AVERAGE[(7.3 ± 3.2) × 10⁻² OUR 2012 AVERAGE]

7.3±1.4	20,21 ESEN	13 BELL	$B_s^0 \rightarrow D_s^- \pi^+$
4.9±2.5±0.0	227 21,22 LI	12 BELL	$B_s^0 \rightarrow J/\psi \eta(')$

• • • We do not use the following data for averages, fits, limits, etc. • • •

7.3+3.3 -3.0 ± 0.1	LOUVOT	09 BELL	$10.86 e^+ e^- \rightarrow B_s^{(*)}\bar{B}_s^{(*)}$
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$\Gamma(B_s\bar{B}_s^* + \text{c.c.})/\Gamma(B_s^*\bar{B}_s^*)$	Γ_{12}/Γ_{13}
<u>VALUE</u>	<u>CL%</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

<0.16

90 BONVICINI 06 CLE3 $e^+ e^-$

$\Gamma(\text{no open-bottom})/\Gamma_{\text{total}}$	Γ_{14}/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u>

0.042+0.046 -0.006 OUR EVALUATION

$\Gamma(\gamma(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{16}/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

5.3±0.3±0.5 325 24 CHEN 08 BELL $10.87 e^+ e^- \rightarrow \gamma(1S)\pi^+\pi^-$

$\Gamma(\gamma(2S)\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{17}/Γ
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u> <u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>

7.8±0.6±1.1 186 24 CHEN 08 BELL $10.87 e^+ e^- \rightarrow \gamma(2S)\pi^+\pi^-$

NODE=M092R01
 NODE=M092R01
 → UNCHECKED ←

NEW

NODE=M092R34
 NODE=M092R34

→ UNCHECKED ←

NODE=M092R19
 NODE=M092R19

NEW

NODE=M092R24
 NODE=M092R24

NODE=M092R03
 NODE=M092R03

NODE=M092R25
 NODE=M092R25

NEW

NODE=M092R04
 NODE=M092R04

NODE=M092R33
 NODE=M092R33

→ UNCHECKED ←

NODE=M092R20
 NODE=M092R20

NODE=M092R21
 NODE=M092R21

$\Gamma(\Upsilon(3S)\pi^+\pi^-)/\Gamma_{\text{total}}$	Γ_{18}/Γ	NODE=M092R22 NODE=M092R22
<u>VALUE (units 10^{-3})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
$4.8^{+1.8}_{-1.5} \pm 0.7$	10	24 CHEN
		08 BELL
		10.87 $e^+e^- \rightarrow \Upsilon(3S)\pi^+\pi^-$
$\Gamma(\Upsilon(1S)K^+K^-)/\Gamma_{\text{total}}$	Γ_{19}/Γ	NODE=M092R23 NODE=M092R23
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
$6.1^{+1.6}_{-1.4} \pm 1.0$	20	24 CHEN
		08 BELL
		10.87 $e^+e^- \rightarrow \Upsilon(1S)K^+K^-$
$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma(\Upsilon(2S)\pi^+\pi^-)$	Γ_{20}/Γ_{17}	NODE=M092R31 NODE=M092R31
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
$0.45 \pm 0.08^{+0.07}_{-0.12}$	ADACHI	12 BELL
		10.86 $e^+e^- \rightarrow \text{hadrons}$
$\Gamma(h_b(2P)\pi^+\pi^-)/\Gamma(\Upsilon(2S)\pi^+\pi^-)$	Γ_{21}/Γ_{17}	NODE=M092R32 NODE=M092R32
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
$0.77 \pm 0.08^{+0.22}_{-0.17}$	ADACHI	12 BELL
		10.86 $e^+e^- \rightarrow \text{hadrons}$
$\Gamma(\phi \text{ anything})/\Gamma_{\text{total}}$	Γ_{22}/Γ	NODE=M092R12 NODE=M092R12
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
$0.138 \pm 0.007^{+0.023}_{-0.015}$	HUANG	07 CLEO
		$\Upsilon(5S) \rightarrow \phi X$
$\Gamma(D^0 \text{ anything + c.c.})/\Gamma_{\text{total}}$	Γ_{23}/Γ	NODE=M092R10 NODE=M092R10
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
$1.076 \pm 0.040 \pm 0.068$	DRUTSKOY	07 BELL
		$\Upsilon(5S) \rightarrow D^0 X$
$\Gamma(D_s \text{ anything + c.c.})/\Gamma_{\text{total}}$	Γ_{24}/Γ	NODE=M092R02 NODE=M092R02
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
0.46 ± 0.06 OUR AVERAGE	18 DRUTSKOY	07 BELL
0.472 $\pm 0.024 \pm 0.072$		
0.44 $\pm 0.09 \pm 0.04$		
	25 ARTUSO	05B CLE3
		$e^+e^- \rightarrow D_s X$
$\Gamma(J/\psi \text{ anything})/\Gamma_{\text{total}}$	Γ_{25}/Γ	NODE=M092R11 NODE=M092R11
<u>VALUE (units 10^{-2})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
$2.060 \pm 0.160 \pm 0.134$	DRUTSKOY	07 BELL
		$\Upsilon(5S) \rightarrow J/\psi X$
$\Gamma(B^0 \text{ anything + c.c.})/\Gamma_{\text{total}}$	Γ_{26}/Γ	NODE=M092R26 NODE=M092R26
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
$0.770^{+0.058}_{-0.056} \pm 0.061$	352	DRUTSKOY
		10 BELL
		$\Upsilon(5S) \rightarrow B^0 X$
$\Gamma(B^+ \text{ anything + c.c.})/\Gamma_{\text{total}}$	Γ_{27}/Γ	NODE=M092R27 NODE=M092R27
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>
$0.721^{+0.039}_{-0.038} \pm 0.050$	711	DRUTSKOY
		10 BELL
		$\Upsilon(5S) \rightarrow B^+ X$
13 Not independent of DRUTSKOY 10 values for $\Upsilon(5S) \rightarrow B^{\pm,0}$ anything.		
14 Using measurements or limits from AQUINES 06.		
15 Assuming isospin conservation.		
16 Supersedes DRUTSKOY 07.		
17 Supersedes ARTUSO 05B. Combining inclusive ϕ , D_s , and B measurements. Using $B(D_s^+ \rightarrow \phi\pi^+) = 4.4 \pm 0.6\%$ from PDG 06.		
18 Using $B(D_s^+ \rightarrow \phi\pi^+) = (4.4 \pm 0.6)\%$ from PDG 06.		
19 Uses a model-dependent estimate $B(B_s \rightarrow D_s X) = (92 \pm 11)\%$.		
20 Supersedes LOUVOT 09.		
21 With $N(B_s^{(*)}\bar{B}_s^{(*)}) = (7.11 \pm 1.30) \times 10^6$.		
22 The ratios $N(B_s^*\bar{B}_s^*)/N(B_s^{(*)}\bar{B}_s^{(*)})$ and $N(B_s^*\bar{B}_s^0)/N(B_s^{(*)}\bar{B}_s^{(*)})$ are measured with a correlation coefficient of -0.72 .		
23 From a measurement of $\sigma(e^+e^- \rightarrow B_s^*\bar{B}_s^*)/\sigma(e^+e^- \rightarrow B_s^{(*)}\bar{B}_s^{(*)})$ at $\sqrt{s} = 10.86$ GeV.		
24 Assuming that the observed events are solely due to the $\Upsilon(5S)$ resonance.		
25 ARTUSO 05B reports $[\Gamma(\Upsilon(10860) \rightarrow D_s \text{ anything + c.c.})/\Gamma_{\text{total}}] \times [B(D_s^+ \rightarrow \phi\pi^+)] = 0.0198 \pm 0.0019 \pm 0.0038$ which we divide by our best value $B(D_s^+ \rightarrow \phi\pi^+) = (4.5 \pm 0.4) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.		

$\gamma(10860)$ REFERENCES

ESEN	13	PR D87 031101	S. Esen <i>et al.</i>	(BELLE Collab.)
ADACHI	12	PRL 108 032001	I. Adachi <i>et al.</i>	(BELLE Collab.)
LI	12	PRL 108 181808	J. Li <i>et al.</i>	(BELLE Collab.)
CHEN	10	PR D82 091106	K.-F. Chen <i>et al.</i>	(BELLE Collab.)
DRUTSKOY	10	PR D81 112003	A. Drutskoy <i>et al.</i>	(BELLE Collab.)
AUBERT	09E	PRL 102 012001	B. Aubert <i>et al.</i>	(BABAR Collab.)
LOUVOT	09	PRL 102 021801	R. Louvot <i>et al.</i>	(BELLE Collab.)
CHEN	08	PRL 100 112001	K.-F. Chen <i>et al.</i>	(BELLE Collab.)
DRUTSKOY	07	PRL 98 052001	A. Drutskoy <i>et al.</i>	(BELLE Collab.)
DRUTSKOY	07A	PR D76 012002	A. Drutskoy <i>et al.</i>	(BELLE Collab.)
HUANG	07	PR D75 012002	G.S. Huang <i>et al.</i>	(CLEO Collab.)
AQUINES	06	PRL 96 152001	O. Aquines <i>et al.</i>	(CLEO Collab.)
BONVICINI	06	PRL 96 022002	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
ARTUSO	05B	PRL 95 261801	M. Artuso <i>et al.</i>	(CLEO Collab.)
BESSON	85	PRL 54 381	D. Besson <i>et al.</i>	(CLEO Collab.)
LOVELOCK	85	PRL 54 377	D.M.J. Lovelock <i>et al.</i>	(CUSB Collab.)

 $\gamma(11020)$

$$I^G(J^{PC}) = 0^-(1^{--})$$

 $\gamma(11020)$ MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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 11019 ± 8 OUR AVERAGE[11.019 ± 0.008 GeV OUR 2012 AVERAGE]

$11019 \pm 5 \pm 7$	BESSON	85	CLEO	$e^+ e^- \rightarrow$ hadrons
11020 ± 30	LOVELOCK	85	CUSB	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10996 ± 2	¹ AUBERT	09E	BABR	$e^+ e^- \rightarrow$ hadrons

¹In a model where a flat non-resonant $b\bar{b}$ -continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated.

 $\gamma(11020)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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 79 ± 16 OUR AVERAGE

$61 \pm 13 \pm 22$	BESSON	85	CLEO	$e^+ e^- \rightarrow$ hadrons
90 ± 20	LOVELOCK	85	CUSB	$e^+ e^- \rightarrow$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
37 ± 3	² AUBERT	09E	BABR	$e^+ e^- \rightarrow$ hadrons

²In a model where a flat non-resonant $b\bar{b}$ -continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated.

 $\gamma(11020)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $e^+ e^-$	$(1.6 \pm 0.5) \times 10^{-6}$

 $\gamma(11020)$ PARTIAL WIDTHS

$\Gamma(e^+ e^-)$			Γ_1
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$\Gamma(e^+ e^-)$			Γ_1
0.130 ± 0.030 OUR AVERAGE			
$0.095 \pm 0.03 \pm 0.035$	BESSON	85	CLEO
0.156 ± 0.040	LOVELOCK	85	CUSB

 $\gamma(11020)$ REFERENCES

AUBERT	09E	PRL 102 012001	B. Aubert <i>et al.</i>	(BABAR Collab.)
BESSON	85	PRL 54 381	D. Besson <i>et al.</i>	(CLEO Collab.)
LOVELOCK	85	PRL 54 377	D.M.J. Lovelock <i>et al.</i>	(CUSB Collab.)

NODE=M092

REFID=54894
 REFID=53962
 REFID=54116
 REFID=53531
 REFID=53358
 REFID=52661
 REFID=52646
 REFID=52153
 REFID=51621
 REFID=51852
 REFID=51624
 REFID=51106
 REFID=50995
 REFID=51004
 REFID=50992
 REFID=22368
 REFID=22369

NODE=M093

NODE=M093M

NODE=M093M
 NEW

NODE=M093M;LINKAGE=AU

NODE=M093W

NODE=M093W

NODE=M093W;LINKAGE=AU

NODE=M093215;NODE=M093

DESIG=1

NODE=M093220

NODE=M093W1
 NODE=M093W1

NODE=M093

REFID=52661
 REFID=22368
 REFID=22369

NON- $q\bar{q}$ CANDIDATES

NODE=MXXX050

Non- $q\bar{q}$ Candidates

OMITTED FROM SUMMARY TABLE

For a review on gluonium and other non- $q\bar{q}$ candidates see PDG 06, Journal of Physics, G **33** 1 (2006). See also the "Note on scalar mesons" in the $f_0(500)$ Particle Listings, our note "New charmonium-like states" in PDG 08, Physics Letters **B667** 1 (2008), and the extensive chapter on Spectroscopy in N. Brambilla *et al.* (Quarkonium Working Group), The European Physical Journal **C71** 1534 (2011).

NODE=M201

NODE=M201

BRAMBILLA 11 EPJ C71 1534
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N. Brambilla *et al.*
 C. Amsler *et al.*
 W.-M. Yao *et al.*

(Quarkonium Working Group)
 (PDG Collab.)
 (PDG Collab.)

REFID=53692
 REFID=52166
 REFID=51004